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VSEBINA / INDICE GENERALE / CONTENTS

Short scientific article
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UDC 582.26(262.3 Boka Kotorska)

DISTRIBUTION OF SEAWEED *FUCUS VIRSOIDES* J. AGARDH IN BOKA KOTORSKA BAY (SOUTH ADRIATIC SEA)

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ABSTRACT

The aim of this work was to contribute to the knowledge of spatial distribution of Fucus virsoides *J. Agardh, an endemic alga of the Adriatic Sea. Boka Kotorska Bay was defined as one of the southernmost limits of* F. virsoides*, so we investigated its distribution in this area. The research was carried out by snorkelling and observing from the coast. 14 localities of* F. virsoides *were found and additional 4 which, however, already disappeared or were in the process of disappearing.*

Key words: *Fucus virsoides*, Boka Kotorska Bay, South Adriatic

DISTRIBUZIONE DELL'ALGA MARINA *FUCUS VIRSOIDES* J. AGARDH NELLA BAIA DI BOKA KOTORSKA (ADRIATICO MERIDIONALE)

SINTESI

Lo scopo del presente studio era quello di ampliare le conoscenze in merito alla distribuzione spaziale dell'alga endemica dell'Adriatico, Fucus virsoides *J. Agardh. La baia di Boka Kotorska è stata definita come uno dei limiti più meridionali di* F. virsoides*, pertanto l'autrice ha studiato la distribuzione dell'alga in tale area. La ricerca è stata condotta mediante osservazioni dalla costa e ispezioni in acqua con l'ausilio del boccaglio. Sono state trovate 14 località colonizzate da* F. virsoides*, ed è stato inoltre osservato il processo di regressione in 4 località.*

Parole chiave: *Fucus virsoides*, baia di Boka Kotorska, Adriatico meridionale

INTRODUCTION

The most sinuous part of Adriatic coast, Boka Kotorska Bay, is situated in the southeastern part of the Adriatic (Fig. 1). In comparison with the open part of Montenegrin coast, this aquatic area shows a large number of differences. Boka Kotorska Bay (coastline of the bay is 105 km) comprises inlets and four smaller bays (Kotor Bay, Risan Bay, Tivat Bay and Herceg Novi Bay) with specific hydrographic characteristics and features of submarine relief. Because of the specific abiotic conditions, marine life in the Bay is specific as well. Unfortunately, benthic flora and vegetation of this bay are poorly known. One of the first remarks on this topic was made by Linardić (1949) in the "Studies on the Adriatic *Fucus*". Later, information on *Fucus virsoides* was sparse. Solazzi (1971), who was the first to study benthic flora in Boka Kotorska Bay, recorded *F. virsoides* at two localities in Kotor Bay (Radimiri and Institute of Marine Biology). Antolić & Špan (1990) provided important additional information of benthic flora on this bay. For the *F. virsoides* there is no indication as to its precise locality, but merely Boka Kotorska Bay as a whole. Although Boka Kotorska Bay was defined as the southern limit of the species' area (Linardić, 1949), Kashta (1995/96) reported on disjunction in the area of *F. virsoides* along the Albanian coast. The aim of this work was to expand the knowledge of spatial distribution of this endemic alga for the Adriatic Sea at one of the southernmost limits of its range.

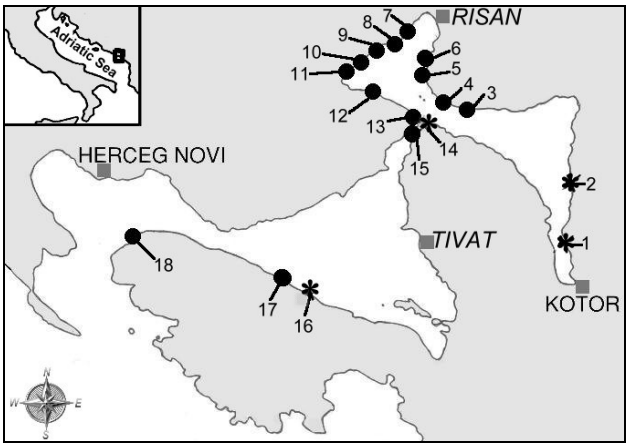

Fig. 1: Map of the investigated area and localities of** F. virsoides: • **– existing sites, ∗ – disappeared sites.
Legend: 1 – Institute of Marine Biology; 2 – Radimiri; 3 – Dražin Vrt; 4 – Perast1; 5 – Perast2; 6 – Ban; 7 – Carine; 8 – Sopot; 9 – Strp; 10 – Lipci; 11 – Morinj; 12 – Kamenari; 13 – Turski rt; 14 – Gospa od Anđela; 15 – Andrići; 16 – Krašići; 17 – Krašići2; 18 – Male Rose.
Sl. 1: Zemljevid raziskanega območja z lokalitetami vrste** F. virsoides: ● **– obstoječe lokalitete, ∗ – izginule lokalitete.
Legenda: 1 – Inštitut za morsko biologijo, Kotor; 2 – Radimiri; 3 – Dražin Vrt; 4 – Perast1; 5 – Perast2; 6 – Ban; 7 – Carine; 8 – Sopot; 9 – Strp; 10 – Lipci; 11 – Morinj; 12 – Kamenari; 13 – Turski rt; 14 – Gospa od Anđela; 15 – Andrići; 16 – Krašići; 17 – Krašići2; 18 – Male Rose.

MATERIAL AND METHODS

The research was carried out in Boka Kotorska Bay by snorkelling in the summer months of 2003–2004 and by observation from the coast during the entire period. Localities in Kotor and Risan Bays were observed occasionally during ten-year period. The fixation of few samples was done with 4% formalin seawater, whereas the rest of algal material is preserved as herbarium material.

RESULTS AND DISCUSSION

During the studies carried out in the investigated area, *Fucus virsoides* was found in non-continuous zone, at 14 localities (Fig. 1). The alga is widely distributed in the Risan Bay (9 localities), in contrast to other parts of Boka Kotorska Bay. Rocky bottom, as required by *Fucus* sp., is present only on the small inter-tidal surfaces of the Bay, and one of the reasons for numerous *Fucus* sites in Risan Bay is the rocky substrate in the inter-tidal zone. Regarding the localities of Krašići and Gospa od Anđela, disappearance of *Fucus* was observed. The reason for such state of affairs is anthropogenic, *i.e.* the habitat disturbance. The rapid urbanization and construction of numerous buildings close to the shore-line caused disappearance of the tiny rocky habitat for *F. virsoides*. The disappearance of the species in Kotor Bay is also caused by anthropogenic factor, although in a slightly different way. Urbanization is very rapid in this zone, too, but habitat disturbance is probably not as crucial as eutrophication. The Bay of Boka Kotorska is a natural eutrophic zone, but due to its numerous sewage system outputs as well as city harbours and weak hydro-dynamism, it could no longer be tolerated by *F. virsoides*. Munda (1982) indicates a partial restitution of *F. virsoides* at some fairly polluted sites, probably due to the increased resistance or gradual adaptation to pollution by organic wastes, but restitution of *F. virsoides* sites have never been observed in Boka Kotorska Bay. Additional reasons for the disappearance of *F. virsoides* from the Bay could be partial changes in the abiotic conditions (temperature and salinity). *F. virsoides* is a euryhaline and eurythermal alga, but the increase in seawater temperature, air temperature and salinity (Regner *et al.*, 2003) at one of the southern localities of its range could be the factor of its elimination, although experimental data are necessary to clarify this hypothesis. Regarding the habitat characteristic, the well sheltered Risan Bay is certainly most appropriate not only because

of its rocky substrate but also because of great input of fresh water. This is why salinity values are significantly lower in relation to Kotor Bay and especially to Tivat and Herceg Novi Bays. Lower temperature values (particularly in the surface layers) are also significant (Stjepčević, 1967; Vukanić, 2004) and favourable for *F. virsoides*. Developing of conceptacules (reproductive organs), which could be found not only in spring but also in late summer and autumn, are the proof of favourable habitat conditions in Risan Bay (Fig. 2).

The ramification of all collected samples is typically dichotom-dichopodial, with numerous prolifications appearing on the bitten parts. There are also many anomalous formations on the thallus, but as Boka Kotorska Bay is one of the southernmost limits of its range, the morphological variability of the collected samples was not taken into consideration.

Fig. 2: *F. virsoides* ***in the Risan bay.***
Sl. 2: *F. virsoides* ***v Risanskem zalivu.***

CONCLUSION

The aim of this work was to expand the knowledge of spatial distribution of *Fucus virsoides* J. Agardh, an endemic alga of the Adriatic Sea, in Boka Kotorska Bay, one of the southernmost limits of the species' range. The results of our field studies indicate 14 *F. virsoides* localities, with most of them situated in Risan Bay. Favourable conditions for *F. virsoides* in Risan Bay are due to the great input of fresh water, lower temperature and salinity values (considerably differing from those of the open part of the Adriatic Sea), rocky surface in the inter-tidal zone, and relatively undisturbed environment.

During the recent studies, disappearance of 2 sites was observed (Krašići and Gospa od Anđela), while 2 sites virtually disappeared before these studies were carried out (Radimiri and Institute of Marine Biology). The disappearance of these sites was probably caused by anthropogenic influence, but further research would be necessary to evaluate the level of impact caused by habitat disturbances, concentration of organic wastes, temperature and salinity increase or variability of other chemical and physical parameters.

RAZŠIRJENOST MORSKE ALGE *FUCUS VIRSOIDES* J. AGARDH V ZALIVU BOKA KOTORSKA (JUŽNO JADRANSKO MORJE)

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POVZETEK

Namen raziskave je bil prispevati k poznavanju razširjenosti alge Fucus virsoides *J. Agardh, endemične vrste v Jadranskem morju, ki je eno najjužnejših meja njenega areala. Vzorci razširjenosti alge* F. virsoides *so bili preučevani v Zalivu Boka Kotorska (južni Jadran), terenske raziskave pa so pokazale, da v Zalivu uspeva na 14 lokalitetah. Večina izmed teh leži v Risanskem zalivu (delu Zaliva Boka Kotorska), predvsem zaradi ugodnih razmer v njih, in sicer kamnite površine v medbibavičnem pasu, precejšnjega dotoka sladke vode, njenih nižjih vrednosti temperature in slanosti in razmeroma neokrnjenega okolja.*

Med nedavnimi raziskavami je bilo ugotovljeno, da alga izginja z dveh lokalitet in da je na nadaljnjih dveh izginila že pred raziskavami. Avtorica domneva, da je treba razlog za izginevanje te vrste iskati v antropogenih vplivih, in dodaja, da bi bile potrebne dodatne raziskave, da bi lahko ocenili negativne vplive zaradi antropogenih motenj in pritiskov na njihov habitat in variabilnosti drugih kemijskih in fizičnih parametrov.

Ključne besede: *Fucus virsoides*, Zaliv Boka Kotorska, južni Jadran

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Short scientific article
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PRELIMINARY INVESTIGATIONS ON CRUSTACEANS ASSOCIATED WITH THE MEDITERRANEAN MUSSEL (*MYTILUS GALLOPROVINCIALIS* LAMARCK, 1819) BEDS IN THE UPPER INFRALITTORAL OF THE BOSPHORUS (TURKEY)

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ABSTRACT

*Twenty crustacean species associated with the Mediterranean mussel (*Mytilus galloprovincialis *Lamarck, 1819) beds were recorded in the upper infralittoral zone of the Bosphorus. Two species,* Microdeutopus algicola *Della Valle, 1893 and* Stenothoe tergestina *Nebeski, 1811, were recorded for the first time in this area.*

Key words: Crustacea, *Mytilus galloprovincialis*, Bosphorus

OSSERVAZIONI PRELIMINARI SU CROSTACEI ASSOCIATI A BANCHI DI MITILO COMUNE (*MYTILUS GALLOPROVINCIALIS* LAMARCK, 1819) NELL'INFRALITORALE SUPERIORE DEL BOSFORO (TURCHIA)

SINTESI

*Venti specie di crostacei associate a banchi del mitilo comune (*Mytilus galloprovincialis *Lamarck, 1819) sono state determinate nell'infralitorale superiore del Bosforo. Due specie,* Microdeutopus algicola *Della Valle, 1893 e* Stenothoe tergestina *Nebeski, 1811, vengono segnalate per la prima volta in quest'area.*

Parole chiave: Crustacea, *Mytilus galloprovincialis*, Bosforo

This article is dedicated to the memory of our professor Erdoğan Okuş.

INTRODUCTION

The Bosphorus is a passage between the Black Sea and the Sea of Marmara and is the northernmost part of the Turkish Straits System, which plays significant roles in the biology of the Mediterranean and the Black Sea basins. The Strait acts as a biological barrier between the Sea of Marmara and the Black Sea, limiting the penetration of given species between both seas. By means of two-layered current regime of the Bosphorus, a number of species penetrate the Black Sea from the Sea of Marmara and vice versa, thus the Strait serves as a biological corridor. The Bosphorus is also an acclimatization zone for the Mediterranean species (Öztürk & Öztürk, 1996).

Prior to this study, Heller (1863), Colombo (1885), Ostroumoff (1896), Marion (1898), Devedjian (1926), Demir (1952), Tortonese (1959), Caspers (1968), Topaloğlu & Kihara (1993), Balkıs & Albayrak (1994) and Uysal *et al.* (2002) recorded some benthic crustaceans from the Bosphorus. Among them, the work of Topaloğlu & Kihara (1993) also considered the crustacean species associated with the mussel beds in a small area of the Bosphorus.

The purpose of this study is to determine the crustaceans associated with the Mediterranean mussel beds and to contribute to the recognition of zoobenthic assemblages in the Bosphorus, where the waters of the Mediterranean and the Black Sea mix.

MATERIAL AND METHODS

Sampling of the crustaceans from mussel beds was carried out in January 2003 at 10 stations located at both coasts of the Bosphorus (Fig. 1). Samples were collected from the upper infralittoral zone at depth range of 0.5-1 m. All benthic organisms of the mussel community were removed from the hard substratum by a spatula and fixed in 4% neutral formalin solution. In addition, some environmental parameters such as salinity, temperature and dissolved oxygen were measured at each sampling station. In the laboratory, the samples were sifted in a 1 mm mesh sieve with fresh water and crustaceans separated from the retained material. Separated specimens were preserved in 70% ethanol. The crustaceans were identified to the species level using stereo and compound microscopes. The specimens were deposited in the first author's personal collection.

RESULTS AND DISCUSSION

Environmental parameters:

There was no significant difference in each variable of surface temperature, dissolved oxygen and salinity among the stations (Dispersion index and χ^2 test; $p < 0.05$). The mean salinity of the study area was 18.1±0.06 psu, the mean temperature was 6.7±0.19 °C, and the mean dissolved oxygen 7.44 ±0.09 mg l^{-1} with 95% confidence level.

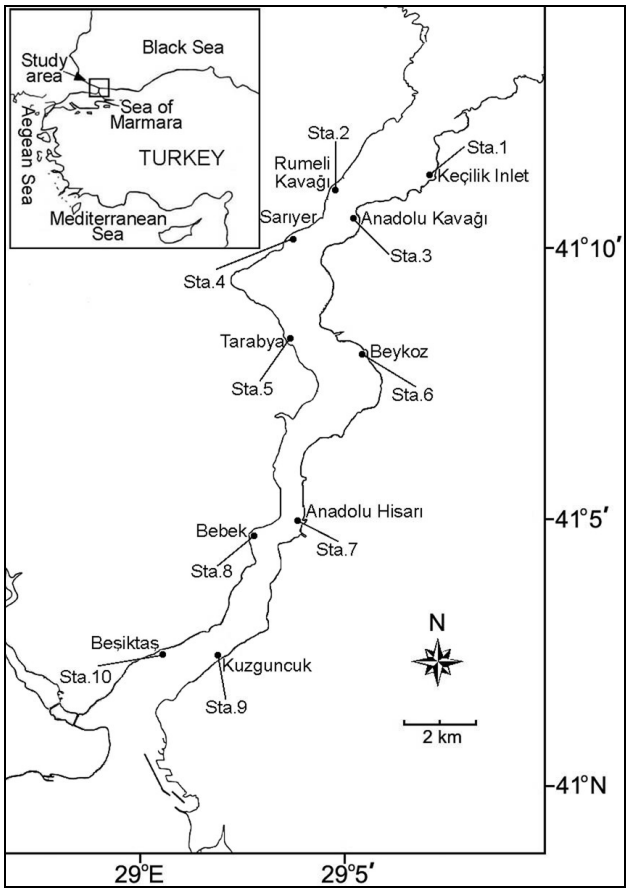

Fig. 1: Location of sampling stations in the Bosphorus.
Sl. 1: Lokacije vzorčišč v Bosporski ožini.

Fauna

A total of 20 species representing 19 genera and 5 orders were recorded in the area. The amphipods *Microdeutopus algicola* Della Valle, 1893 and *Stenothoe tergestina* Nebeski, 1811 are new records for the Bosphorus (Tab. 1).

Applying presence/absence data of the community to the McConnaughey similarity index, two different clusters of the stations were obtained at a truncation level of ≈ 60%. Group 1 embraced stations 1, 9, 10, whereas Group 2 included the remaining stations. However, the one-way ANOSIM test shows that there was not a significant dissimilarity between Groups 1 and 2 ($p < 99$). Moreover, the MDS plot confirmed insignificant representation of the stations (stress = 0.115).

Before the present study, the only research concerning the macrobenthos associated with the Mediterranean mussel beds in the Bosphorus has been carried out by

Tab. 1: List of species found at each station.
Tab. 1: Seznam vrst, ugotovljenih na posameznih vzorčiščih.

SPECIES	STATIONS									
	1	2	3	4	5	6	7	8	9	10
CIRRIPEDIA										
Balanus improvisus Darwin, 1854*	+	+	+	+	+	+	+	+	+	+
DECAPODA										
Pisidia longimana (Risso, 1816)*	-	+	+	+	+	+	-	-	-	+
Xantho poressa (Olivi, 1792)*	+	+	-	-	+	-	-	-	-	-
Pilumnus hirtellus (Linnaeus, 1761)	-	+	+	+	+	+	+	-	-	-
TANAIDACEA										
Tanais dulongii (Audouin, 1826)	+	-	-	+	-	-	-	-	+	-
ISOPODA										
Jaera nordmanni (Rathke, 1837)*	-	-	-	-	-	-	-	-	+	+
Dynamene bidentatus (Adams, 1800)*	-	+	-	+	+	-	+	+	+	-
Sphaeroma serratum (Fabricius, 1787)	+	+	+	+	+	+	+	+	+	+
Idotea balthica (Pallas, 1772)	+	-	+	-	+	-	+	-	+	+
Synisoma capito (Rathke, 1837)*	-	-	-	-	-	-	+	+	-	-
AMPHIPODA										
Caprella liparotensis Haller, 1879*	-	-	-	-	-	-	-	-	+	+
Ampithoe ramondi Audouin 1826	-	-	-	-	+	-	+	-	+	-
Microdeutopus algicola Della Valle, 1893*,†	-	-	-	-	-	+	-	-	-	-
Gammarellus angulosus (Rathke, 1843)*	-	-	-	-	+	-	-	+	-	-
Echinogammarus olivii (Milne-Edwards, 1830)*	+	-	-	+	+	-	-	-	+	+
Hyale perieri (Lucas, 1849)*	+	+	+	+	+	+	+	+	+	+
Jassa marmorata (Holmes, 1903)	-	+	+	+	+	+	+	+	+	+
Jassa ocia (Bate, 1862)*	-	+	-	+	-	-	-	+	+	-
Melita palmata (Montagu, 1804)	-	+	+	-	+	+	+	-	-	+
Stenothoe tergestina Nebeski, 1881*,†	-	-	-	-	+	-	-	-	+	+

* New record for the mussel associated crustacean fauna of the Bosphorus.
† New record for the Bosphorus.

Topaloğlu & Kihara (1993). According to these authors, Crustacea is the dominant taxon in the area investigated, where a total of 22 crustacean species have been recorded.

The present study has contributed 13 new records (Tab. 1) to the mussel associated crustacean fauna previously examined by Topaloğlu & Kihara (1993), and two of them (*M. algicola* and *S. tergestina*) are new records for the Bosphorus. As a result, the number of the crustacean species has now been increased to 35. The number of crustacean species associated with the mussel assemblages varies from 8 (Sicily, Italy: D'Anna *et al.*, 1985) to 32 (Izmir Bay, Turkey: Kocataş, 1978) at various sites in the Mediterranean infralittoral (Chintiroglou *et al.*, 2004). The number of species seems to depend on the specific features of each study area (polluted/non-polluted, midlittoral/infralittoral) (Thiel & Ullrich, 2002; Chintiroglou *et al.*, 2004). The present study can be accepted as an example for a moderately polluted infralittoral area located between the Mediterranean and the Black Seas.

In conclusion, the current status of the species composition of benthic communities existing in the Bosphorus is far from complete and it is obvious that further research will increase this number.

PREDHODNE RAZISKAVE RAKOV V HABITATIH UŽITNE KLAPAVICE (*MYTILUS GALLOPROVINCIALIS* LAMARCK, 1819) V GORNJEM INFRALITORALU BOSPORSKE OŽINE (TURČIJA)

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POVZETEK

*V gornjem infralitoralnem pasu Bosporske ožine je bilo zabeleženih 20 vrst rakov, živečih v habitatih užitne klapavice (*Mytilus galloprovincialis *Lamarck, 1819). Dve izmed vrst,* Microdeutopus algicola *Della Valle, 1893 in* Stenothoe tergestina *Nebeski, 1811 sta bili v tem območju ugotovljeni prvič.*

Ključne besede: Crustacea, *Mytilus galloprovincialis*, Bospor

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BENTHIC MACROFAUNA OF A SUBMARINE CAVE ON THE ISTRIAN PENINSULA (CROATIA)

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ABSTRACT

Karst phenomena are common under the sea level in the submarine zone of Istrian Peninsula: a typical phenomenon of karst hydrography is the presence of submarine fresh water springs locally known as "vrulije". Submarine caves are considered ideal habitats, where selection of species is remarkable due to the reduced light, slow water circulation and low nutrient level. From the entrance to the inward end of the cave there is a progressive reduction in the number of taxa and total biomass. This study examines the macrofauna inhabiting the soft bottom, including a thanatocoenosis analysis, and the sessile fauna living on the hard substrate of the wall and the ceiling in a small submarine cave in the Adriatic Sea. The cave presents, on hard substrata, the circalittoral community of the semi-dark cave and there is a horizontal zonation of the communities inhabiting the wall. The macrofauna inhabiting the soft bottom did not show any clear zonation in terms of species richness or abundance.

Key words: macrobenthos, submarine cave, Northern Adriatic, Croatia

LA MACROFAUNA BENTONICA DI UNA GROTTA SOTTOMARINA NELLA PENISOLA ISTRIANA (CROAZIA)

SINTESI

Lungo la costa Istriana sono frequenti i fenomeni dell'idrografia carsica che danno origine a grotte ed a risorgive subacquee localmente conosciute con il nome di "vrulije". Nelle grotte subacquee parametri come la riduzione dell'intensità luminosa, la diminuzione dei nutrienti e della circolazione delle masse d'acqua provocano una progressiva riduzione del numero di taxa e della biomassa totale procedendo dall'ingresso verso il fondo della grotta. Il presente lavoro esamina le comunità macrobentoniche del substrato molle, l'analisi delle tanatocenosi e la fauna sessile insediata sul substrato roccioso delle pareti e del soffitto di una piccola grotta subacquea del Mare Adriatico. La grotta presenta, sul substrato roccioso, comunità circalitorali caratteristiche delle grotte semioscure ed indica una zonazione orizzontale delle comunità insediate lungo le pareti. La macrofauna presente nel substrato molle non indica una chiara zonazione in termini ricchezza e di abbondanza.

Parole chiave: macrobenthos, grotta sottomarina, Alto Adriatico, Croazia

INTRODUCTION

The Croatian coastal and channel area is mostly a submerged karst relief. Various karst phenomena (sinkholes and caves) are common under the sea level in the submarine zone of the Adriatic Sea, including the islands in the Kvarner region (Božičević, 1992; Arko-Pijevac *et al.*, 2001). A typical phenomenon of karst hydrography is the presence of submarine freshwater springs (locally known as "vrulje") connected to the Adriatic Sea by coastal underground water circulation systems, which flow mostly through marine caves (Alfirević, 1966). Their number in the Adriatic Sea is relatively large along the eastern shore. They are present from the west coast of Istria to the Albanian waters, and in the Adriatic archipelago (Alfirević, 1969).

Submarine caves are considered ideal habitats to study the influence of many environmental parameters on the settled benthic communities (Riedl, 1978) due to the presence of strong environmental gradients on spatial scales of a few meters (Ott & Svoboda, 1976; Cinelli *et al.*, 1977). In the interior of a cave, changes in the intensity of light and in the hydrodynamic regime are easily perceived (Benedetti-Cecchi *et al.*, 1996).

Due to the reduced light, slow water circulation and low nutrient level, submarine caves are considered to be a habitat where selection of species is remarkable (Riedl, 1966; Harmelin *et al.*, 1985; Zabala *et al.*, 1989; Bianchi & Morri, 1994). Dark caves show some similarities with the bathyal zone (Arko-Pijevac *et al.*, 2001) with regard to hydrodynamics, nutrient level (Fichez, 1990, 1991a, b) and fauna composition including sponges, anthozoans, serpulids and bryozoans (Harmelin, 1985; Harmelin *et al.*, 1985).

All studies on Mediterranean caves have revealed a remarkable horizontal zonation of the animal communities inhabiting the walls (Laborel & Vacelet, 1958; Laborel, 1960; Pérès & Picard, 1964; Gili *et al.*, 1982; Bibiloni *et al.*, 1984). The number of taxa from the entrance to the inward end of the caves is progressively reduced; sponges, scleractinians and polychaetes become dominant at the expense of other taxa, and total biomass decreases (True, 1970; Gili *et al.*, 1986).

This study examines the macrofauna inhabiting the soft bottom, including a thanatocoenosis analysis, and the sessile fauna living on the hard substrate of the wall and the ceiling in a small submarine cave in the Adriatic Sea (Columbera cave) characterized inside by the presence of freshwater springs.

MATERIAL AND METHODS

Columbera cave (45°10'18"N, 14°14'07"E) is located near Brseč, on the eastern coast of the Istrian Peninsula (Fig. 1). The cave entrance is about 3 m high at a depth of 6 to 9 m at the bottom of a cliff. The cave has a linear shape and is approximately 11 m long. The length-width ratio is about 3:1 and this ratio is characteristic of a "Sackhöhle" cave, as described by Riedl (1966) (Fig. 2). Muddy-sand and rough organic detritus, mostly shells fragments, cover the cave floor. Two freshwater springs are located in the cave at 10.6 and 2 m from the entrance: the former in muddy sediment, the latter in detritic sand.

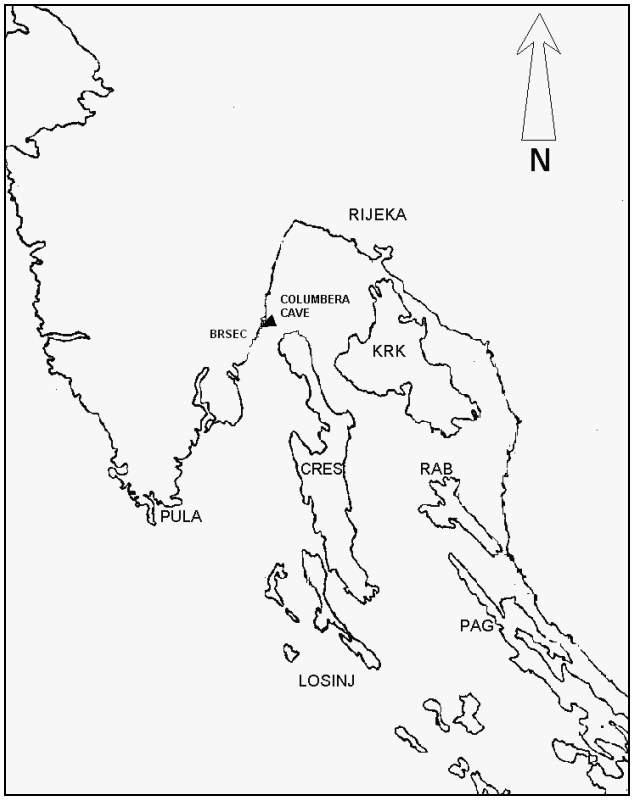

Fig. 1: Location of Columbera cave.
Sl. 1: Lokacija jame Columbere.

Direct sampling was performed in April 2001 using scuba dive. The sessile macrofauna on the wall and ceiling of the cave was analyzed by visual-census in each meter from the entrance to the bottom of the cave (1 to 9 meters) and organisms were photographed with a Nikon F90 in an underwater housing; species of uncertain determination were collected for identification in the laboratory. Hierarchical classification and MDS based on the Bray-Curtis similarity coefficient was calculated, using complete linking (PRIMER software package developed at the Plymouth Marine Laboratory).

Three sites were chosen to study soft bottom communities: site A located in the inner area of the cave, site B situated among the springs, site C close to the outer spring. A set of four squares (0.1 m^2 × 0.20 m) were positioned, next to each other, on site A and B to collect the sediment using a small shovel (Di Geronimo &

Robba, 1976). In site C it was impossible to place the square into the sediment and thus only 9 l of sediment were collected directly using a shovel. Samples were sieved on 1 mm mesh and preserved in 4% formalin. In the laboratory, living organisms were sorted and determined at the lowest possible taxonomic level. The thanatocoenoses were analyzed by sorting intact shells and skeletal structures; each empty bivalve shell was counted as a separate individual (Peharda *et al.*, 2002).

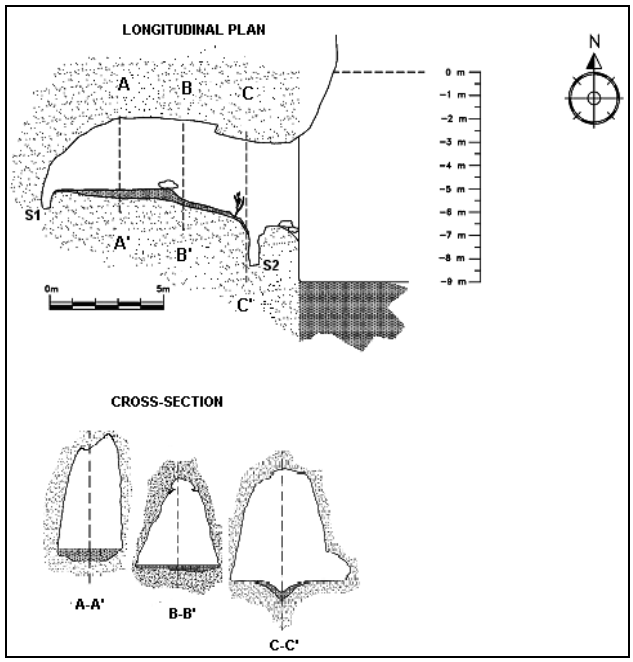

Fig. 2: Cave longitudinal plane and cross section.
Sl. 2: Podolžna ploskev in prerez jame.

RESULTS

A total of 21 sessile species living on the hard substrate were recognized. The more representative taxa were Porifera (15 species), Cnidaria (2 species), Briozoa (2 species) and Tunicata (2 species).

Hierarchical classification and MDS performed on sessile species yielded three groups: group I included 18 species from the entrance to 3 meters (1–3), group II with 18 species represented the middle portion to 6 meters (4–6) and group III with 9 species comprised the inner area to 9 meters (7–9) (Fig. 3). Table 1 shows the species present in the cluster groups: seven species were found in each group I–II–III, from the entrance to the bottom of the cave: nine species were found only in groups I and II, to 6 meters, and 1 species in the groups II and III. Two species were found only in group I, one species in group II, and one species in group III.

A total of 197 living organisms belonging to 26 taxa were collected in the soft bottom. The richest site in terms of abundance and taxa was site A (23 taxa and 136 specimens), whereas site C was the poorest (8 taxa and 14 specimens), probably due to the small amount of sediment collected. The main taxonomic groups were (Tab. 2): molluscs (8%), polychaetes (37%), sipunculids (31%), crustaceans (2%) and echinoderms (22%). The most representative groups in terms of taxa and abundance were polychaetes and molluscs, respectively, whereas the most abundant species were the sipunculid *Aspidosiphon muelleri* and the echinoderm *Amphiura chiajei*. These two species were present at all sampling sites.

Tab. 1: Hard bottom community (sessile fauna).
Tab. 1: Združba trdega dna (prirasli organizmi).

	Species	group I 0–3 m	group II 3–6 m	group III 6–9 m
Tunicata	*Diplosoma listerianum*	*		
Tunicata	*Halocynthia papillosa*	*		
Porifera	*Anchinoe tenacior*	*	*	
Porifera	*Aplysina aerophoba*	*	*	
Porifera	*Cacospongia scalaris*	*	*	
Porifera	*Chondrosia reniformis*	*	*	
Porifera	*Clathrina clathrus*	*	*	
Porifera	*Dysidea avara*	*	*	
Porifera	*Hemymicale columella*	*	*	
Porifera	*Ircinia variabilis*	*	*	
Bryozoa	*Myriapora truncata*	*	*	
Bryozoa	*Hornera frondiculata*		*	
Porifera	*Agelas oroides*	*	*	*
Porifera	*Axinella verrucosa*	*	*	*
Porifera	*Crambe crambe*	*	*	*
Porifera	*Oscarella lobularis*	*	*	*
Cnidaria	*Parazoanthus axinellae*	*	*	*
Porifera	*Petrosia ficiformis*	*	*	*
Porifera	*Spirastrella cunctatrix*	*	*	*
Porifera	*Aplysina cavernicola*		*	*
Cnidaria	*Leptopsammia pruvoti*			*

Regarding the thanatocoenosis, a total of 6555 specimens belonging to 83 species were collected in the detritus. The richest station in term of abundance and taxa was site B, whereas site C was the poorest. The main taxonomic groups were: molluscs (90%), echinoderms (9%) and brachiopods (1%); of the molluscs, 56% were gastropods, 43.7% bivalves and 0.3% scaphopods (Tab. 3). Of the 83 species, only 5 species were detected as living organisms, accounting for 28% of the total specimens collected as the thanatocoenosis. Twelve species were found at all sampling stations and represented 36% of total abundance (Tab. 3).

DISCUSSION AND CONCLUSIONS

Submarine caves are mostly found around the islands and islets in the area of the open Adriatic and along the eastern rocky shore; they are fairly scarce in the other parts of the Adriatic Sea. The hard substrate community

inside caves is characterized by the presence of the circalittoral biocoenosis of semi-dark caves (Gamulin-Brida, 1967) or GSO (Grottes Semi-Obscures) (Pérès & Picard, 1964). This biocoenosis comprises only animals, and sponges represent the dominant fauna (Pérès & Picard, 1964). In the Columbera cave, more than 70% of sessile fauna were sponges. The following species characterized the GSO biocoenosis: *Aplysina cavernicola, Petrosia ficiformis* (Fig. 4), *Oscarella lobularis, Agelas oroides* (Porifera); and *Parazoanthus axinellae* (Fig. 5) and *Leptposammia pruvoti* (Pérès & Picard, 1964) (Cnidaria). The sponge *Aplysina aerophoba*, characteristic of the infralittoral biocenosis of photophilic algae, was found nearby the entrance and in the middle zone of the cave. Some species common in the sciaphilic niche of this biocenosis or present in the circalittoral biocenosis of rocks in the open sea are also present in the GSO biocoenosis: *Axinella verrucosa* (Fig. 5) (Porifera), *Echinaster sepositus* (Echinodermata), *Bonellia viridis* (Echiurida), *Diplosoma listerianum* and *Halocynthia papillosa* (Tunicata), *Hornera frondiculata* (Bryozoa), as well as *Myriapora truncata* (Bryozoa), a species characteristic in the circalittoral biocenosis of coralligenous (Pérès & Picard, 1964; Gamulin-Brida, 1967, 1974).

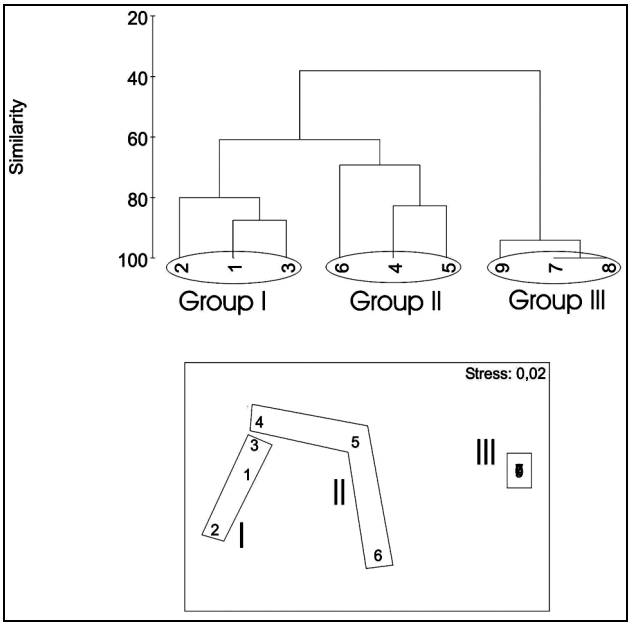

Fig. 3: (Top) Hierarchical classification and (bottom) multidimensional scaling (MDS) of the hard bottom community.
Sl. 3: (Zgoraj) Hierarhična klasifikacija in (spodaj) večdimenzionalno skaliranje (MDS) združbe, živeče na trdem dnu.

Cluster analysis and MDS clearly showed a separation among the inner area of the cave and the entrance up to the middle portion. Group III showed a reduction in the number of species (True, 1970; Gili *et al.*, 1986), and the populations constituted of species capable of living in the inner area of semi-dark caves (Bianchi & Morri, 1994, 1999): in particular, *L. pruvoti* was present only at this site, and small serpulids, characteristics of dark caves, (Bianchi & Morri, 1994) were noted.

At the entrance, all species present at the other stations inside the cave were found, with the exception of *H. frondiculata, A. cavernicola* and *L. pruvoti. D. listerianum* and *H. papillosa* disappeared in the middle portion, where *H. frondiculata* was recorded and *A. cavernicola* appeared. Among the motile fauna we observed, at the entrance, the opistobranch *Flabellina affinis* and *Cratena peregrina*, the echiurid *B. viridis* and the echinoderm *E. sepositus*, whereas an individual of the cnidarian *Cerianthus membranaceus* was found in the soft bottom of the middle area. Finally, many individuals of the opisthobranch *Discodoris atromaculata* feeding on the sponge *P. ficiformis* (Cattaneo-Vietti *et al.*, 1990; Jaklin, 1998; Turk, 2000) were found between the entrance and the bottom.

Tab. 2: Soft bottom community.
Tab. 2: Združba mehkega dna.

Station	A	B	C
Mollusca			
Cerithium vulgatum			1
Bittium latreillii	3		2
Polinices nitida			1
Marshallora adversa	1		
Muricopsis cristata	2		1
Nassarius incrassatus	1	1	
Myrtea spinifera	1		
Plagiocardium papillosum	1		1
Polychaeta			
Paraonidae non ident.	1	1	
Pseudoleiocapitella fauveli	5	7	
Capitellidae non ident.	8		
Glycera rouxii	1		
Glycera unicornis	2	1	
Nereidae non ident.			1
Nephtys hombergi	1	1	
Sthenelais sp.	1		
Aponuphis bilineata	11	15	
Eunice vittata	2		
Marphysa bellii	1	1	
Sabellidae non ident.	11	2	
Sipunculida			
Aspidosiphon mulleri[+]	54	2	6
Crustacea			
Athanas nitescens	1		
Anisopoda	1		
Amphipoda	1		
Echinodermata			
Amphiura chiajei[+]	25	16	1
Schizaster canaliferus	1		
Total abundance	**136**	**47**	**14**
Total No. of species	**23**	**10**	**8**

[+] Species present in each sampling station.

In the inner area of the cave, 9–11 m, no organisms were found and the visibility was limited owing to the inflowing spring freshwater. The ceiling of this area and of another portion of the cave, directly influenced by two freshwater springs, was completely defaunated with evident erosion phenomena.

The macrofauna inhabiting the soft bottom did not show any clear zonation, either in terms of species richness or abundance, from the entrance to the bottom of the cave, as opposed to the case for solid substrata. *Amphiura chiajei* (Echinodermata) and *Aspidosiphon mulleri* (Sipunculida) were the most abundant species, the former being common in coastal detritic bottoms more or less mixed with mud (Gamulin-Brida, 1967), the latter inhabiting *Turritella communis* shells, the latter being characteristic for the circalittoral biocenosis of the coastal terrigenous muds (Gamulin-Brida, 1967) or VTC (Vases Terrigènes Cotieres) (Pérès & Picard, 1964; Gamulin-Brida, 1974). Most of polychaetes found are common in the soft bottoms of the northern Adriatic Sea (Aleffi *et al.*, 2003) and the species recorded are not specific to particular biocoenoses or sediment texture. The same considerations are valid for other taxa, except for *Plagiocardium papillosum* and *Schizaster canaliferus*, which are considered to prefer the circalittoral biocenosis of sand-detritus more or less mixed with mud (DC-E) (Gamulin-Brida, 1974). Gastropods shells constituted about 50% of shell detritus and most of them are common on the solid substrata in the infralittoral and mediolittoral zones (Vio & De Min, 1999), such as *Bittium reticulata* and *Diodora* sp. Some species are restricted to or prefer the infralittoral biocenosis of photophilic algae, such as: *Columbella rustica*, *Patella caerulea*, *Cerithium vulgatum* and *Rissoa variabilis* (Gamulin-Brida, 1967, 1974). Many of bivalve shells present are commonly found in detritic bottoms and some species are considered characteristics or preferential of the circalittoral biocenosis of coastal detritic bottoms like: *Pitar rudis*, *Venus casina*, *Tellina balaustina*, *P. papillosum*, *Lima hians*, *Chlamys varia* and *C. flexuosa* (Gamulin-Brida, 1967, 1974). Among endolitic bivalve burrowers, *Lithophaga lithophaga* lives also abundantly in the boring holes on the rock round Rijeka Bay from the lower mediolittoral zone down to 13 m depth (Hrs-Brenko *et al.*, 1998).

The faunal composition and zonation on solid substrata in Columbera cave were similar to those described in a submarine cave near Vrbnik on the Island of Krk (Arko-Pijevac *et al.*, 2001): but the number of taxa in Columbera cave (Porifera 15, Cnidaria 3 and Echinodermata 2) was always lower than in the latter cave (Porifera 22, Cnidaria 7 and Echinodermata 5).

Although the length of the cave and its entrance location are not as deep as at Vrbnik cave, this study revealed a marked horizontal zonation within the animal communities inhabiting the walls (Laborel & Vacelet, 1958; Laborel, 1960; Pérès & Picard, 1964; Gili *et al.*, 1982; Bibiloni *et al.*, 1984), even if not considering the abundance and the cover of sessile fauna. Species that are characteristic or common in the biocenosis of rocks in the open sea were found. This biocenosis occurs at the boundary between the circalittoral and bathyal zone, near the break in the slope of the continental plateau (Gamulin-Brida, 1967). Reduced light penetration and slow water circulation are probably the main environmental parameters to permit the settlement of these species in few meters depth, thus showing some similarities with the bathyal zone (Arko-Pijevac *et al.*, 2001). Below

Fig. 4: *Discodoris atromaculata* ***(Foto: B. Furlan).***
Sl. 4: *Discodoris atromaculata* ***(Foto: B. Furlan).***

1% of superficial light intensity, benthic populations are markedly sciaphylic (Bianchi & Morri, 1999), and sciaphylic organisms, mostly sponges and cnidarians, were observed just several meters under the sea surface in the crevices of breakwater dams in the Gulf of Trieste (Bettoso *et al.*, 1999). In this area, Orel & Specchi (1967) already pointed out the role of light conditions and substratum morphology as the main features determining the zonation of benthic organisms in a cavity of the tidal zone. Water circulation determines the structure of benthic populations in caves (Bianchi & Morri, 1999). Gili *et al.* (1986) found no gradient for temperature, salinity, oxygen, chlorophyll *a* or suspended particles, suggesting a constant circulation within the caves which guarantees water-exchange. In Columbera cave, the

Tab. 3: Thanatocoenosis.
Tab. 3: Tanatocenoza.

Station	A	B	C
Gastropoda			
Alvania aspera	8	6	
Alvania cancellata	49	45	
Alvania cimex	313	258	
Alvania geryonia	38	27	
Bittium reticulata	243	157	
Bolma rugosa	1	2	
Calliostoma laugieri	9	13	
Cerithiopsis minima	5	7	
Cerithiopsis tubercolaris	9	6	
Clanculus corallinus	9	24	
Clanculus cruciatus	3	2	
Diodora graeca		10	
Diodora italica^{+}	45	61	1
Emarginula octaviana	41	75	
Emarginula sicula	3	19	
Epitonium aculeatum	12	7	
Epitonium commune	48	22	
Eulimia bilineata	1	2	
Fusinus rostratus	31	41	
Haliotis lamellosa^{+}	12	70	1
Homalopoma sanguineum	1		
Jujubinus exasperatus	22	35	
Leiostraca glabra	3	1	
Mangelia multilineolata	5	3	
Mangelia stossiciana	50	52	
Mangelia unifasciata	39	16	
*Marshallora adversa**	152	171	
Mitra nigra	2	4	
*Muricopsis cristata**	273	192	
*Nassarius incrassatus**	172	105	
Patella caerulea		6	
Patella ulyssiponensis^{+}	8	2	12
Philiberthia bofilliana	4		
*Polinices nitida**	30	16	
Raphitoma linearis	18	24	
Rissoa guerrinii	10	18	
Rissoa splendida	16	7	
Rissoa variabilis	17	13	
Rissoina bruguieri	13	8	
Tricolia pullus	2		
Turritella communis	33	11	
Vexillum tricolor	3	3	
Bivalvia			
Nucula nitidosa	9	16	
Abra tenuis	15	1	
Acanthocardia echineata	22	11	
Anodonthia fragilis	11	52	
Anomia ephippium	6	4	
Arca noae^{+}	2	11	1
Arca tetragona	7	19	
Azorinus chamasolen	4	5	
Barbatia barbata^{+}	110	158	23
Chlamys flexuosa		1	
Chlamys multistriata	28	41	
Chlamys varia^{+}	312	364	73
Coralliophaga litophagella	2	6	
Corbula gibba	2	2	
Ctena decussata		1	
Cuspidaria cuspidata		1	
Gouldia minima	14	4	
Hiatella arctica	75	101	
Irus irus	5	2	
Lima hians^{+}	4	36	4
Lithophaga lithophaga^{+}	6	8	4
Mytilaster minimus^{+}	1	1	12
Nuculana pella	1	1	
Palliolum incomparabile		2	
Parvicardium exiguum	51	21	
Pitar rudis	11	3	
*Plagiocardium papillosum**$^{+}$	240	279	28
Pseudochama gryphina^{+}	19	48	17
Scrobicularia cottardi	27	29	
Spondylus gaederopus	1		1
Tellina balaustina	87	49	
Thyasira flexuosa		1	
Timoclea ovata	6	6	
Venus casina^{+}	9	39	4
Venus verrucosa	7	2	
Scaphopoda			
Dentalium vulgare	1		
Dentalium inaequicostatum	10	9	
Fustiaria rubescens		1	
Brachiopoda			
Argyroteca cordata		1	
Argyroteca cuneata	25	12	
Echinodermata			
Echinocyamus pusillus	151	451	
Total abundance	3034	3340	181
Total No. of species	74	78	13

$^{+}$ Species present in each sampling station.

* Species detected as living organisms.

output of freshwater flowing along the ceiling draws the external sea water inside the cave. This fact might promote the water-exchange, although defaunation was observed at sites directly influenced by spring activity. The lack of zonation of the soft bottom community could be related to spring activity, which disturbs sedimentary patterns and consequently community structure. Thus no indicative soft bottom benthic community was present in the cave. The cave probably constitutes a deposit zone for shell detritus coming from outer area because the entrance is open to southern and northern winds (mainly the wind known as "bora").

BENTOŠKA MAKROFAVNA PODMORSKE JAME V ISTRI (HRVAŠKA)

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POVZETEK

Podmorske jame najdemo predvsem ob otokih v odprtem delu Jadranskega morja in vzdolž njegove vzhodne skalnate obale. V istrski jami, imenovani Columbera, obstajata dva izvira sladke vode, kar je značilen pojav kraške hidrografije. Podmorske jame so habitati posebne vrste: parametri, kot so svetloba, vsebnost hranil in kroženje vode, se občutno zmanjšajo že po nekaj metrih in tako vplivajo na izjemen izbor vrst. Trda podlaga v jami je dom cirkalitoralne združbe slabo presvetljenih vodnih okolij, medtem ko med združbami, živečimi na steni jame, obstaja očitna horizontalna conacija. V makrofavni, ki poseljuje mehko dno, ni bilo zaslediti jasne conacije, kar zadeva gostoto in številčnost vrst. Vrste, živeče na mehkem dnu, so značilne za obalno detritično dno, bolj ali manj pomešano z glenom. Dejstvo, da tu ni conacije, bi lahko pripisali sladkovodnima izviroma, ki moteče delujeta na sedimentne vzorce in zatorej tudi na strukturo tam živeče združbe.

Ključne besede: makrobentos, podmorska jama, severni Jadran, Hrvaška

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BIOLOGICAL OBSERVATIONS ON THE BLACK TORPEDO, *TORPEDO NOBILIANA* BONAPARTE 1835 (CHONDRICHTHYES: TORPEDINIDAE), FROM TWO MEDITERRANEAN AREAS

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ABSTRACT

Reproduction of the black torpedo Torpedo nobiliana *is presented in this article on the basis of specimens captured off Tunisia (Central Mediterranean) and off the coast of Languedoc (southern France, northern Mediterranean). The smallest adult male and adult female were 550 mm and 900 mm total length (TL), respectively, and weighed 3,120 and 9,850 g, respectively. The largest male and the largest female were 770 and 1,200 mm TL and weighed 4,890 g and 25,500 g, respectively. The total mass* versus *total length relationships showed significant differences between males and females. Birth probably occurred at a mean TL of 185 mm ± 12.8 and a mean mass of 167.5 g ± 17.6. Both ovaries and both uteri were functional. The diameter of twenty-two yolky oocytes ready to be ovulated ranged between 32 and 38 mm (mean: 35.0 ± 2.1), and their mass between 8.7 and 10.5 g (mean: 9.6 g ± 0.5). CBD based on mean dry masses calculated for* T. nobiliana *was # 8.7, and showed that it was probably an incipient histotrophic species. Gestation lasted for about a year, but oocyte growth is delayed during gestation. A biennial reproductive cycle remains a suitable hypothesis. Ovarian fecundity was related with female size. The juvenile males slightly outnumbered the female ones, and among the adults, females slightly outnumbered males. However, males and females were equally distributed in the total sample.*

Key words: Torpedinidae, *Torpedo nobiliana*, reproductive biology, Tunisia, southern France, Mediterranean

OSSERVAZIONI BIOLOGICHE SU TORPEDINE NERA, *TORPEDO NOBILIANA* BONAPARTE 1835 (CHONDRICHTHYES: TORPEDINIDAE), IN DUE AREE MEDITERRANEE

SINTESI

L'articolo presenta alcuni dati inerenti la biologia riproduttiva di esemplari di torpedine nera, Torpedo nobiliana*, catturati al largo della Tunisia (Mediterraneo centrale) e al largo della costa di Languedoc (Francia meridionale, Mediterraneo settentrionale). La lunghezza totale (TL) del maschio adulto più piccolo è risultata pari a 550 mm, per 3.120 g di peso. La femmina adulta più piccola misurava 900 mm, per 9.850 g di peso. Il maschio più grande misurava 770 mm, per 4.890 g. di peso. La femmina più grande era lunga 1.200 mm, per 25.500 g di peso. Il rapporto fra massa totale e lunghezza totale evidenzia differenze significative fra maschi e femmine. Le femmine raggiungono la maturità sessuale ad una lunghezza totale pari a 185 mm ± 12,8, con una massa media di 167.5 g ± 17,6. A tale stadio entrambe le ovaie e tutti e due gli uteri risultano funzionali. Il diametro di ventidue oociti vitellini, pronti per essere ovulati, è risultato compreso fra 32 e 38 mm (media: 35,0 ± 2,1), per una massa compresa fra 8,7 e 10,5 g (media: 9,6 g ± 0,5). Il CBD, calcolato in base alla media delle masse secche, è risultato pari a # 8,7. La durata della gestazione è di circa un anno, ma la crescita degli oociti viene ritardata durante la gravidanza. Viene pertanto ipotizzato un ciclo riproduttivo biennale. La fertilità è stata messa in relazione alla grandezza della femmina. I giovani esemplari maschi superano di poco in numero le femmine; fra gli adulti sono leggermente più numerose le femmine. All'interno del campione però le femmine ed i maschi risultano uniformemente distribuiti.*

Parole chiave: Torpedinidae, *Torpedo nobiliana*, biologia riproduttiva, Tunisia, Francia meridionale, Mediterraneo

INTRODUCTION

According to Capapé (1989), five torpedinid species occur in the Mediterranean Sea: the Alexandrine torpedo *Torpedo alexandrinsis* Mazhar, 1987, the black-spotted torpedo *Torpedo fuscomaculata* Peters, 1855, the marbled torpedo *Torpedo marmorata* Risso, 1810, the black torpedo *Torpedo nobiliana* Bonaparte, 1835, and the common torpedo *Torpedo torpedo* (Linnaeus, 1758). However, the occurrence of *T. fuscomaculata* requires further observations, whereas the status of *T. alexandrinsis* as a valid species still needs to be confirmed (see Quignard & Tomasini, 2000).

T. nobiliana is rarely landed, although, it used to be widely distributed and reported on both sides of the Atlantic (Bigelow & Schroeder, 1953). Off the western Atlantic shore, Bigelow & Schroeder (1953) reported on the species from New Scotland to Cuba. Off the eastern Atlantic shore, *T. nobiliana* was reported by Muus & Dahlstrøm (1964–1966), from the North Sea and around the British Isles by Wheeler (1969), southward from the Bay of Biscay by Bauchot & Pras (1980), while Quéro *et al.* (1976) suggested that two relative close species occurred in the area, although this opinion still needs further confirmation. Albuquerque (1954–1956) reported on the occurrence of *T. nobiliana* off Portugal. South of the Strait of Gibraltar, *T. nobiliana* was recorded off Morocco by Collignon & Aloncle (1972), southward its occurrence remained doubtful; according to Capapé & Desoutter (1980) and Capapé *et al.* (2001b), it was probably replaced by the ringed torpedo, *Torpedo mackayana* Metzelaar, 1919. In contrast, Smith & Heemstra (1986) reported on the species from off the South African coast.

In the Mediterranean, *T. nobiliana* occurred off the coasts of its western basin (Capapé & Desoutter, 1980), in its eastern basin off Greece (Economidis, 1973) and Turkey (Kabasakal, 2002), whereas the species' easternmost border has been the Levantine basin (Golani, 1996, 2005).

Capapé (1974) provided biological data and Capapé & Desoutter (1980) morphological description from the specimens collected off the northern coast of Tunisia. Additional records from this area and others from the coast of Languedoc (southern France) may increase the knowledge of this species with special regard to its reproductive biology.

MATERIAL AND METHODS

The observed electric rays were collected in two Mediterranean areas: off the northern coast of Tunisia in the southern Mediterranean (Figs. 1 & 2), and off the coast of Languedoc, northern Mediterranean (Figs. 1 & 3).

In the first area, the investigations were conducted between 1970 and 1985: 72 specimens were captured off the northern coast of Tunisia by trawl at depths ranging from 50 to 400 m, down to 500 m at the level of the Bank of Esquerquis on sandy and muddy bottoms, while some among them were recorded on board the oceanographic trawlers 'Dauphin' and 'Hannoun'.

In the second area, the investigations were conducted between 1988 and 2005 off the coast of Languedoc: 8 specimens were collected at depths between 80 and 200 m on sandy and muddy bottoms by trawl. The monthly collection of all the observed specimens is presented in Table 1.

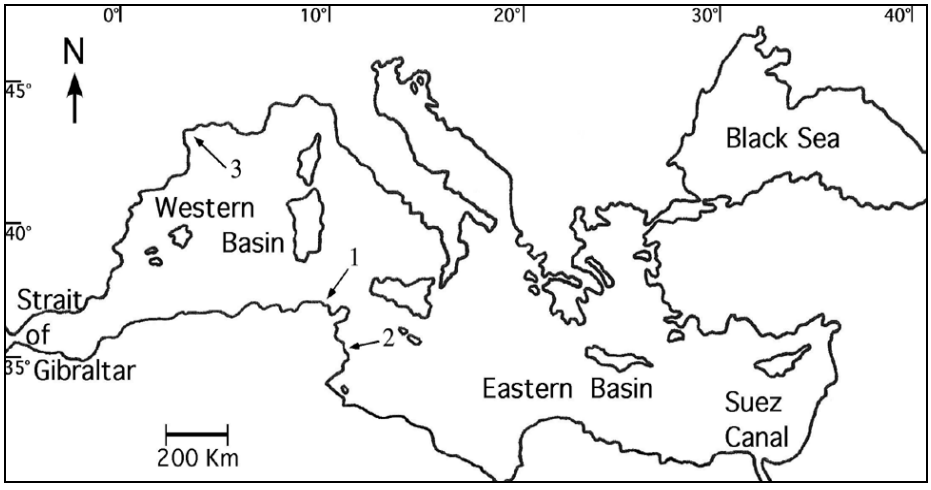

Fig. 1: Map of the Mediterranean Sea with the investigation areas: arrow 1 – northern coast of Tunisia, arrow 2 – southern coast of Tunisia, arrow 3 – coast of Languedoc.
Sl. 1: Zemljevid Sredozemskega morja z raziskanimi območji: puščica 1 – severno tunizijsko obrežje, puščica 2 – južno tunizijsko obrežje, puščica 3 – obrežje Languedoca.

The specimens were measured to the nearest millimetre for total length (TL) following Bass *et al.* (1973) and weighed to the nearest gram, when possible. Measurements comprised clasper length (CL, mm) according to Collenot (1969), and the diameter of yolky oocytes probably ready to be ovulated and developing oocytes. When possible, both categories of oocytes were removed from the ovaries and weighed to the nearest decigram.

The onset of sexual maturity was determined by the relationship between CL *vs.* TL. Bass *et al.* (1973) noted that claspers of juveniles were short and flexible, adding that males were adult when claspers were rigid, elongated and calcified. In addition, some aspects of the testes and the genital organs are described. Size of females at sexual maturity was determined from the condition of ovaries and the morphology of the reproductive tract. Two categories of specimens were distinguished for males and females: juvenile and adult.

To investigate the embryonic development and the role of the mother during gestation, a chemical balance of development (CBD) was considered. CBD is based on the mean dry mass of fertilized eggs and fully developed embryos. CBD can be computed as the mean dry mass of near term embryos and/or neonates divided by the mean dry mass of yellow yolked oocytes or eggs. CBD is a tentative estimate.

In the size mass-total length relationship, comparisons of curves were made by ANCOVA. Tests for significance ($p < 0.05$) were performed by using ANOVA t-test and chi-square test.

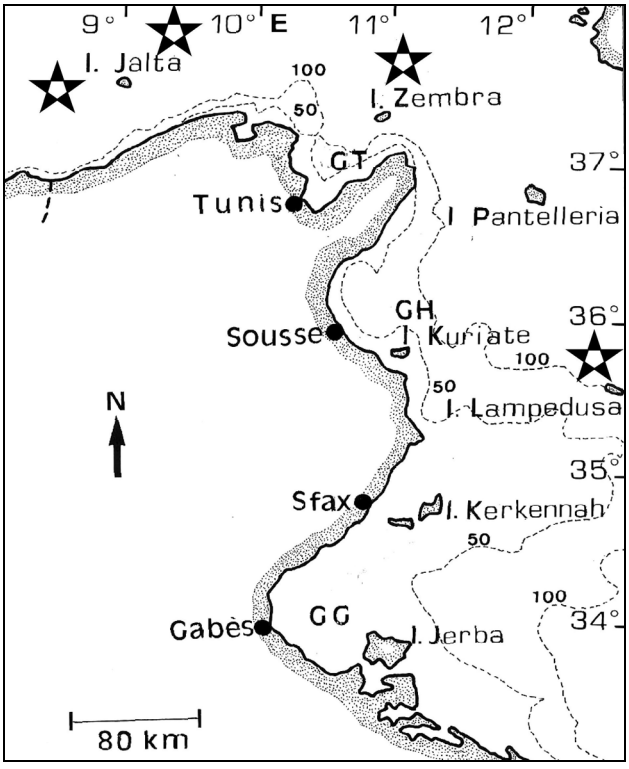

Fig. 2: Map of Tunisia, showing the investigation areas off both southern and northern coasts (black stars).
Sl. 2: Zemljevid Tunizije z raziskanimi območji (črne zvezdice) ob njenem severnem in južnem obrežju.

RESULTS

Size at sexual maturity

Males

During the juvenile stage, the males had short and flexible claspers and both testes and genital duct were membranous and undeveloped. This stage comprised 27 males, ranging between 170 and 770 mm TL. Among the juveniles, the 3 smallest specimens showed on dorsal surface an unhealed umbilical scar and a residual internal umbilical vesicle (remains of yolk absorbed and partially digested). They were probably neonates or aborted embryos, ranging from 170 to 220 mm TL and weighing between 150 and 246 g. Some specimens were caught throughout the year except in March, April and June, with a peak observed in January (Tab. 1).

During the adult stage, the claspers were rigid, elongated and calcified. The testes were developed, with spermatocyst externally visible. The genital duct was conspicuously developed and the vas deferens (*sensu* Hamlett *et al.* 1999; Jones *et al.*, 2005) clearly twisted. Sperm was generally present in the seminal vesicles. The adult stage comprised all the males over 550 mm TL. Fourteen specimens were observed. The largest adult male was 770 mm TL, weighing 4890 g. Mass of the heaviest specimen reached 5400 g and it measured 750 mm TL. Some specimens were captured in February, March, June, and slightly more in November and December (see Tab. 1, Fig. 4).

Females

Twenty juvenile females were observed, ranging from 195 to 800 mm TL and weighing from 150 to 550 mm TL. The smallest juvenile could be considered as neonate or aborted (see males above). Juveniles had whitish ovaries with oocytes of microscopic size and indistinct oviducal glands. The genital duct was membranous, filiform and translucent. However, females between 650 and 800 mm TL exhibited translucent oocytes, a conspicuous oviducal gland and a differentiated genital duct. They probably entered a maturation stage at about 600 mm TL. Juvenile females were caught practically throughout the year, except in February, March and July, with a peak observed in November (Tab. 1).

Tab. 1: Monthly collection of the observed** T. nobiliana **for total sample.
Tab. 1: Mesečna zbirka opazovanih električnih skatov** T. nobiliana **v skupnem vzorcu.

		Months												
Sex	**Category**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Males	Juveniles	9	1	–	–	4	3	–	1	1	4	2	2	27
	Adults	–	2	1	–	–	3	–	–	–	–	4	4	14
	Total	9	3	1	–	4	6	–	1	1	4	6	6	41
Females	Juveniles	1	–	–	2	5	2	–	1	1	1	7	–	20
	Adults	2	4	2	–	2	1	1	1	–	3	3	–	19
	Total	3	4	2	2	7	3	1	2	1	4	10	–	39
Grand total		**12**	**7**	**3**	**2**	**11**	**9**	**1**	**3**	**2**	**8**	**16**	**6**	**80**

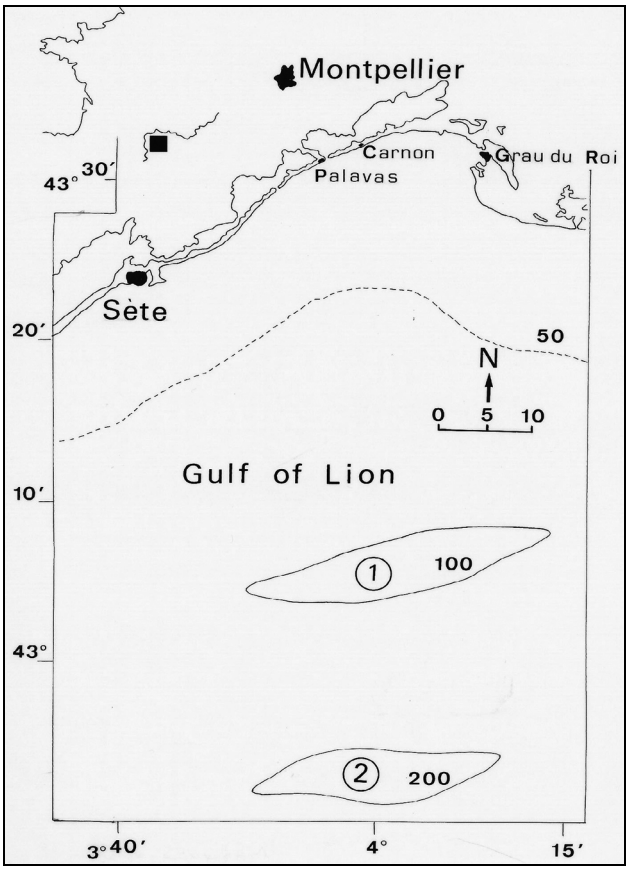

Fig. 3: Map of France pointing out the coast of Languedoc and the captures sites of** T. nobiliana **in the 'pits' from off Sète, where the small spotted catshark** Scyliorhinus canicula **① and the blackmouth catshark** Galeus melastomus **② are the dominant elasmobranch species.
Sl. 3: Zemljevid Francije z obrežjem Languedoca in lokacijami, kjer je bil v "votlinah" nedaleč od mesta Sète ujet električni skat** T. nobiliana**, kjer sta prevladujoči vrsti med morskimi psi in skati morski mački** Scyliorhinus canicula **① in** Galeus melastomus **②.

In the adults, the genital apparatus was clearly developed and both ovaries exhibited batches of developing and fully yolked oocytes. The genital tract was enlarged, but no pregnant female was clearly observed; they were probably *post partum* females or females having aborted. Nineteen adult females were observed, ranging from 900 to 1200 mm TL and weighing between 9850 and 25500 g. Some adult females were captured monthly, except in September (Tab. 1).

Size and mass

Of the 5 smallest free-swimming specimens observed, 4 were males and a single female. Males ranged from 170 to 220 mm TL and weighed from 150 to 246 g, the female was 195 mm TL and weighed 180 g. Mean TL and mean mass calculated from these data were 185 mm ± 12.8 and 167.5 g ± 17.6, respectively. The diameter of 22 yolky oocytes ready to be ovulated ranged between 32 and 38 mm (mean: 35.0 ± 2.1), and their mass between 8.7 and 10.5 g (mean: 9.6 g ± 0.5). CBD based on mean dry masses calculated for *Torpedo nobiliana* was about 8.7.

The total mass *vs.* total length relationships showed significant differences between males and females (Fig. 5). The latter did not bear embryos. The relationships for males were

$\log TM = 2.39 \times \log TL - 3.11$; $r = 0.98$; $n = 40$,

and for females

$\log TM = 2.66 \times \log TL - 3.81$; $r = 0.98$; $n = 28$; ($F = 7.4$; $p = 0.008$).

Reproductive status of females

Records obtained from adult females *T. nobiliana* are summarized in Table 2. No pregnant female was observed, however, records 10 to 13 show that uteri of females were distended when caught, and they were full of uterine fluid secreted by largely developed villi covering uterine walls, while their ovaries were in a resting phase. These females were probably *post partum* specimens. This suitable hypothesis is confirmed by the fact

Tab. 2: Reproductive status of female** T. nobiliana**. Condition of ovary and uteri during gestation.
Tab. 2: Reprodukcijski status samice** T. nobiliana**. Stanje jajčnika in maternic med brejostjo.

Record	Month of catch	Female size (TL, mm)	Female mass (g)	Ovarian condition	Oocytes number	Oocytes diameter (mm)	Oocytes mass (g)	Uteri condition
1	Jan	980	?	Vitellogenesis	?	15–17	?	Resting
2	Jan	> 900	?	Vitellogenesis	?	?	?	Resting
3	Feb	# 1000	?	Vitellogenesis	?	> 15	?	Resting
4	Feb	1020	?	Vitellogenesis	?	?	?	Resting
5	Feb	> 900	?	Vitellogenesis	?	?	?	Resting
6	Feb	1000	?	Vitellogenesis	?	?	?	Resting
7	Mar	980	?	Vitellogenesis	15+15	>30	?	Resting
8	Mar	1000	?	Vitellogenesis	> 40	> 30	?	Resting
10	May	940	11000	Resting	–	–	–	Distended
11	May	950	12000	Resting	–	–	–	Distended
11	Jun	970	13500	Resting	–	–	–	Distended
12	Jul	960	12300	Vitellogenesis	–	–	–	Distended
13	Aug	985	17000	Vitellogenesis	–	–	–	Distended
14	Oct	980	13000	Vitellogenesis	8+8	11–12	1.2–1.5	Resting
15	Oct	1020	18900	Vitellogenesis	16+16	12–15	1.5–1.7	Resting
16	Oct	900	9850	Vitellogenesis	8+7	25–27	7.8–8.5	Resting
17	Nov	950	10000	Vitellogenesis	12+12	30–31	8.5–9.5	Resting
18	Nov	1110	20000	Vitellogenesis	36+35	29–30	7.9–9.4	Resting
19	Dec	1020	20000	Vitellogenesis	34–32	32–38	8.7–9.9	Resting

that the smallest specimens described above were con comitantly captured. The 16 other records show that females exhibited an obvious vitellogenic activity, while their uteri were in a resting phase, thick, not distended and with internal wall not covered by undeveloped villi. Records 1 to 8 and 14 to 19 show a regular increase of oocytes diameter.

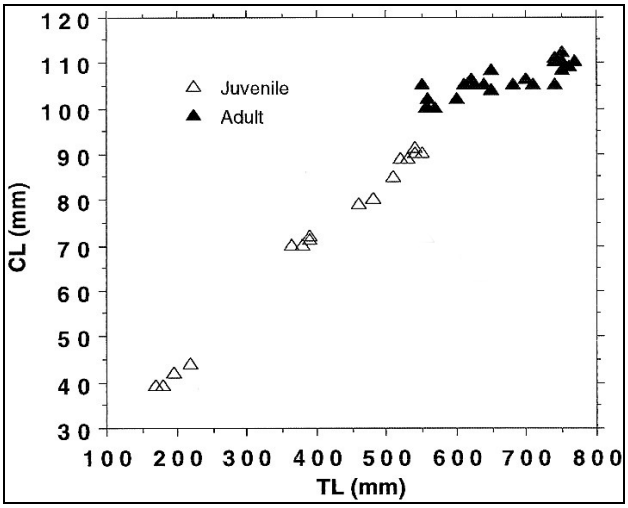

Fig. 4: Clasper length (CL)** vs. **disc width (TL) in male** T. nobiliana**.
Sl. 4: Dolžina spolnega organa (CL) proti širini telesne plošče (TL) pri samcih električnega skata** T. nobiliana**.

Furthermore, Table 2 shows that ovarian fecundity based on counts of yolky oocytes occurring in ovaries increases slightly with female size.

Sex ratio

Table 3 shows that among juveniles, males slightly outnumbered females, whereas among adults females slightly outnumbered males. However, these differences were not significant. In the total sample, males and females were equally distributed.

Tab. 3:** T. nobiliana **sex ratio for each category of specimens and for the total sample.
Tab. 3: Razmerje med spoloma pri vrsti** T. nobiliana **za vsako kategorijo osebkov in skupni vzorec.

Category	Males	Females	Males: Females
Juveniles	27	20	1.35: 1
Adults	14	19	1: 1.35
General total	**41**	**39**	**1.05: 1**

DISCUSSION

Although *Torpedo nobiliana* has a wide distribution, it was rarely recorded and its reproductive biology is poorly known. As other batoid species, such as rajids (see Hunter *et al.*, 2005a, b), a decline of captures of *T.*

Tab. 4: CBD values calculated in incipient histotrophic elasmobranch species.
Tab. 4: Vrednosti CBD, izračunane pri zametkovnih histotrofičnih vrstah morskih psov in skatov.

Species	CBD values	Areas	Authors
Hexanchus griseus	3.7	Mediterranean	Capapé *et al.* (2004)
Galeorhinus galeus	1.0	Maghreb	Capapé *et al.* (2005a)
Oxynotus centrina	1.36	Mediterranean	Capapé *et al.* (1999b)
Rhinobatos cemiculus	1.0	Gulf of Gabès	Capapé & Zaouali (1994)
R. cemiculus	1.85	Senegal	Seck *et al.* (2004)
R. rhinobatos	1.15	Gulf of Gabès	Capapé *et al.* (1997)
R. rhinobatos	1.43	Senegal	Capapé *et al.* (1999a)
Torpedo mackayana	1.20	Senegal	Capapé *et al.* (2001b)
T. marmorata	1.30	Senegal	Capapé *et al.* (2001a)
T. torpedo	1.58	Senegal	Capapé *et al.* (2000)
Torpedo nobiliana	8.7	Mediterranean	This study

nobiliana has been reported during the last decades according to our own observations. The last specimen was captured off the coast of Tunisia in 1980, while between 1980 and 1988 no electric ray was landed in Tunisian fishing sites to our knowledge. Bradaï *et al.* (2004) reported *T. nobiliana* among the species reported off the Tunisian coast referring to previous observations provided by Quignard & Capapé (1971) and Capapé (1975). Moreover, information provided by fishermen since 1985 confirmed that specimens were no longer reported off the Tunisian coast. Has the electric ray disappeared from the area? This phenomenon needs further investigations in order to confirm it. During our investigations in the area, the species was caught especially off the northern coast of Tunisia, and some specimens, including all four juveniles, in southern areas, such as off the Island of Lampedusa (see Fig. 2). In all, 8 specimens were caught off the Languedocian coast during the sixteen year period, with the last specimen observed caught in December 2002 (Tab. 2, record 19). Moreover, Golani (1996, 2005) noted the occurrence of *T. nobiliana* off the Mediterranean coast of Israel, where it had not been formerly reported by Ben-Tuvia (1966, 1971). Moreover, Golani (2005, *pers. comm.*) informed us that the only specimen caught off Israel was a female 265 mm TL, collected on 1st June 1993, by trawl at a depth of ca. 350 m.

Males matured at a smaller size than females and reached a smaller maximum size, confirming previous observations (Capapé & Desoutter, 1980) for specimens from the Tunisian coast and sexual dimorphism in size for other torpedinids species (Tab. 5). Bigelow & Schroeder (1953) noted that off the eastern coast of the United States, specimens up to 610 mm were probably mature. It seems that such observations concerned male *T. nobiliana*.

According to the data presented herein, size at birth was between 170 and 220 mm TL, which is in agreement with Bigelow & Schroeder (1953), who noted that it was between 200 and 250 mm and recorded one embryo of 159 mm TL. Maximum sizes recorded off both Tunisian and Languedocian coast were similar, although smaller than those of other Mediterranean areas. Duméril (1865) reported 1600 mm TL from specimens caught off Italy, and Lozano Rey (1928) 1800 mm TL from those caught off the northern coast of Spain. The largest specimen reported by Bigelow & Schroeder (1953) off the eastern coast of the United States was 1700 mm TL, weighing ca. 90 kg.

Table 2 shows that vitellogenesis occurred throughout the year in some adult females that exhibited a regular development of oocytes, while no embryo was found in each uterus. Vitellogenesis does not proceed in parallel with gestation and similar patterns were observed in other torpedinid species previously studied (Mellinger, 1981, 1989). Our data did not allow us to state about the length of oocytes production. It is generally long in torpedinid species, from 6 to 8 months in the common torpedo *T. torpedo* according to Quignard & Capapé (1974) and Capapé *et al.* (2000), one-two years in the marbled torpedo *T. marmorata* according to Capapé (1979), Mellinger (1981) and Capapé *et al.* (2001a). So, a vitellogenic activity that probably lasts for at least a year remains a suitable hypothesis for *T. nobiliana*, which consequently could reproduce in alternate year.

The CBD about 8.7 for *T. nobiliana* showed that the role of the mother cannot be neglected and it seems that the uterine fluid found in mothers certainly provided a complement of nutriments, inorganic matters, and also protected the embryos throughout their development. However, *T. nobiliana* is close to those sharks, skates and rays considered incipient histotrophic species, *sensu* Hamlett *et al.* (2005), (see Tab. 4), mid-term between lecithotrophic species (CBD <1), such as squatinids (Capapé *et al.*, 2002, 2005b) and matrotrophic species (*sensu* Wourms, 1977, 1981; Wourms *et al.*, 1988), in which CBD reach high values, (*c* CBD > 30), such as

Tab. 5: Size at birth, size at maturity, maximum size (in mm) and fecundity in some torpedinids.
Tab. 5: Velikost osebkov ob rojstvu, velikost v času, ko postanejo spolni zreli, maksimalna velikost (v mm) in plodnost pri nekaterih vrstah iz družine Torpedinidae.

Species	Size at birth	Size at maturity		Maximal size		Ovarian fecundity	Litter size	Area	Authors
		Male	Female	Male	Female				
Torpedo bauchotae	?	?	?		590–790	16–24	?	Coast of Senegal	Capapé *et al.* (2001b)
T. fuscomaculata	?	?	?	?	?	?	5	Indian Ocean	Capapé and Farrugio (1986)
T. mackayana	92–96	315	350	382	500	10–18	6–15	Coast of Senegal	Capapé *et al.* (2001a)
T. marmorata	?	290	390	395	580	3–15	2–13	Coast of Tunisia	Capapé (1979)
T. marmorata	112–145	270	380	380	560	6–19	8–20	Coast of Senegal	Capapé *et al.* (2001a)
T. torpedo	80–97	190	190	390	410	1–15	1–9	Coast of Tunisia	Quignard and Capapé (1974)
T. torpedo	102–125	300	310	445	550	10–28	5–20	Coast of Senegal	Capapé *et al.* (2000)
T. nobiliana	170–220	550	900	750	1200	15–71	?	Mediterranean	This study

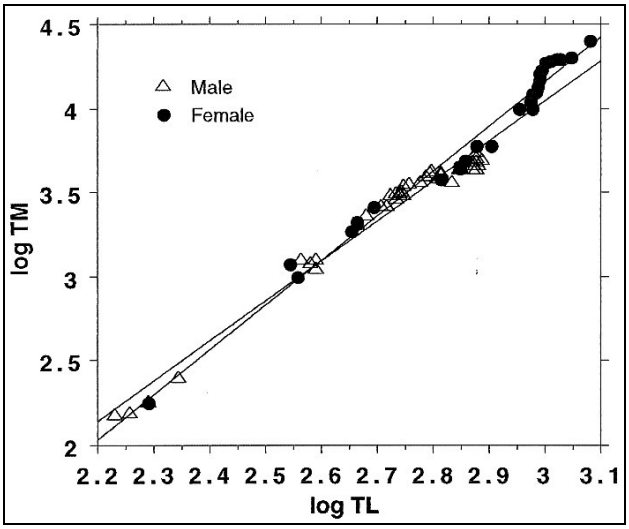

Fig. 5: Total mass (TM) vs. disc width (TL) relationship expressed in logarithmic co-ordinates for male and female** T. nobiliana**. TL was measured to the nearest mm and TM to the nearest gram.
Sl. 5: Razmerje med skupno maso (TM) in širino telesne plošče (TL), izraženo v logaritmičnih koordinatah za samce in samice vrste** T. nobiliana**. TL je bila izmerjena do najbližjega mm, TM pa do najbližjega g.

carcharhinids (Capapé *et al.*, 2003; Saïdi *et al.*, 2005) and dasyatids (Capapé *et al.*, 1992; Capapé & Zaouali, 1995).

T. nobiliana is not a prolific species. Its fecundity was rather low, although higher than in other torpedinid species, and it seems that this phenomenon depends on torpedinid species size (see Table 5).

The slight changes of sex ratio were due to sampling; however, captures of possible *post partum* adult females showed that they probably approach the coast in order to expel their brood in the best environmental conditions.

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REPRODUKTIVNA BIOLOGIJA ELEKTRIČNEGA SKATA *TORPEDO NOBILIANA* BONAPARTE 1835 (CHONDRICHTHYES: TORPEDINIDAE) IZ DVEH LOČENIH OBMOČIJ SREDOZEMSKEGA MORJA

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POVZETEK

Pričujoči članek obravnava reproduktivno biologijo električnega skata Torpedo nobiliana*, in sicer na osnovi osebkov, ujetih v bližini Tunizije in nedaleč od Languedoca v južni Franciji. Skupna dolžina (TL) najmanjšega odraslega samca je merila 550 mm, TL najmanjše odrasle samice pa 900 mm. Samec je tehtal 3.120 g, samica 9.850 g. Največji samec je bil dolg 770 mm in težak 4.890 g, največja samica pa dolga 1.200 mm in težka 25.000 g. Razmerje med skupno maso in celotno TL je pokazalo na očitne razlike med samci in samicami te vrste. Samice so verjetno rojevale pri srednji TL 185 mm ± 12,8 in srednji masi 167,5 g ± 17,6. Funkcionalna sta bila oba jajčnika in obe maternici. Premer 22 rumenjakastih oocitov, pripravljenih na ovulacijo, se je gibal med 32 in 38 mm (srednja vrednost 35,0±2,1 mm), njihova masa pa med 8,7 in 10,5 g (srednja vrednost 9,6±0,5 g). CBD, izračunan za električnega skata* T. nobiliana *na osnovi srednjih mas, je bil # 8,7, hkrati pa je pokazal, da gre bržkone za zametkovno histotrofično vrsto. Brejost je trajala približno leto dni, vendar je rast oocitov med nosečnostjo zamujala. Avtorji zato domnevajo, da gre pri tej vrsti za bienalni razmnoževalni cikel. Sicer pa je bila plodnost povezana z velikostjo samic. Mladostni samci so za malenkost številčno prekašali mladostne samice, kar zadeve odrasle osebke, pa so bile samice malce številčnejše od samcev. Toda v skupnem vzorcu so bili samci in samice razporejeni v enakem razmerju.*

Ključne besede: Torpedinidae, *Torpedo nobiliana*, reproduktivna biologija, Tunizija, južna Francija, Sredozemsko morje

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DISTRIBUTION AND BIOLOGY OF THE BLUNTNOSE SIXGILL SHARK, *HEXANCHUS GRISEUS* (BONNATERRE, 1788) (CHONDRICHTHYES: HEXANCHIDAE), FROM TURKISH WATERS

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ABSTRACT

Hexanchus griseus *(Bonnaterre, 1788) is a rare by-catch species in Turkish waters. Author presents total length/weight relationship of* H. griseus *captured in Turkish waters. Sixgill sharks are captured mostly between September and March, and peaked in February as well as in July, althouh only exceptionally (n = 10, in both months), when fishing is prohibited in Turkish seas. The main source of sixgill sharks, captured in the fishing-prohibited season, are the illegally operated bottom-trawlers and purse-seiners, which land the incidentally captured specimens only for display and media interest. This fact indicates a persisting fishing pressure on* H. griseus *throughout the year. Sixgill sharks were primarly captured by purse-seiners. Bony fishes were the main prey items and found in the 9 of 12 stomachs (75%). The sex ratio is 1 : 2.5 in favour of females. This numerical dominance of females may indicate some form of sex segregation, although several adults would be required before any such conclusion could be drawn.*

Key words: *Hexanchus griseus*, sixgill shark, distribution, biology, Turkish seas, by-catch

DISTRIBUZIONE E BIOLOGIA DI SQUALO CAPOPIATTO, *HEXANCHUS GRISEUS* (BONNATERRE, 1788) (CHONDRICHTHYES: HEXANCHIDAE), IN ACQUE TURCHE

SINTESI

Hexanchus griseus *(Bonnaterre, 1788) è una specie che di rado viene catturata involontariamente in acque turche. L'autore presenta il rapporto fra lunghezza totale e peso negli esemplari di squalo capopiatto catturati nel mare della Turchia. Questi squali sono stati catturati in prevalenza tra settembre e marzo, con un picco nel mese di febbraio e talvolta a luglio, quando la pesca è addirittura proebita. La cattura di questa specie nel periodo in cui la pesca non è consentita, avviene in prevalenza con le reti a strascico. Gli esemplari vengono poi esposti sulla terraferma come attrazione e per il grande interesse dei media. Questi dati dimostrano che* H. griseus *è sottoposto a una forte pressione di pesca durante tutto l'anno. In 9 di 12 stomaci di questa specie esaminati sono stati ritrovati pesci ossei, che sembrano essere le prede più ambite. Il rapporto fra i sessi è risultato di 1 : 2,5 a favore delle femmine. La dominanza delle femmine fa supporre una forma di segregazione sessuale. Tale ipotesi potrebbe venir confermata con un numero maggiore di esemplari adulti esaminati.*

Parole chiave: *Hexanchus griseus*, squalo capopiatto, distribuzione, biologia, acque turche, cattura involontaria

INTRODUCTION

The bluntnose sixgill shark, *Hexanchus griseus* (Bonnaterre, 1788), is a large, wide-ranging, benthic or pelagic deep-sea shark of subarctic, temperate and tropical seas, living over insular and continental shelves and upper slopes (Compagno, 1984), from the surface to 2500 m (Zhan *et al.*, 1987; in Ebert, 1994). Its presence in the Mediterranean Sea as well as in the adjacent waters has been well documented in specific studies on the species (*e. g.* Barrull & Mate, 2000; Capapé *et al.*, 2003, 2004; Kabasakal, 1998, 2004, 2005), as well as in general ichthyological (Carus, 1889-1893; Riedl, 1983; Boeseman, 1984; Bilecenoğlu *et al.*, 2002) and several regional works such as by Capapé (1977) off Toulon, Quignard & Capapé (1972) in Tunisia, Barrull *et al.* (1999) in Catalan waters, Lipej *et al.* (2004) in the Adriatic Sea, Tortonese (1956) and Bini (1967) in Italy, Cugini & De Maddalena (2003) off Pescara (Italy), Ben-Tuvia (1971) and Golani (1997) in Israel, and Kabasakal & Kabasakal (2004) in the northern Aegean Sea.

Although no targeted fishery is carried out on *H. griseus* in Turkish waters, it is accidentally captured by fishermen. Like many other sharks occurring in Turkish waters, study of *H. griseus* has been neglected in favour of more commercially important bony fishes for many years. Due to the drastic decline in stocks of many commercial bony fishes during the last two decades, there has been a tendency for considering the sharks as targeted species in marine fishery (Kabasakal & Kabasakal, 2004). However, the obvious paucity of necessary information on the life history parameters and population dynamics of many species, complicates the implementation of regulatory measures on shark fishery. This circumstance, in turn, complicates the conservation of sharks, including *H. griseus* in Turkish waters.

In order to create a database on sharks of Turkish waters, the Ichthyological Research Society (IRS) has been carrying out regular surveys on sharks, including *H. griseus*, since 2000. In a recent study on *H. griseus* carried out by IRS, Kabasakal (2004) reported data on reproductive biology and stomach contents of 39 specimens captured by commercial fishing vessels. Based on the captures of two specimens, one in prebosphoric waters (Kabasakal, 2004; case No. 32) and one off the coast of Bartın (central part of Turkish Black Sea coast; Kabasakal, 2005), the author suggested that the distribution of *H. griseus* may have extended to the Black Sea.

After the pioneering study by Kabasakal (2004), the ongoing research on the bio-ecology of *H. griseus* revealed the capture of further 21 specimens, mostly landed by the commercial fishing fleet along the Anatolian coast. In the present study, case stories of these 21 specimens are presented. Furthermore, length-weight relationship of *H. griseus* from Turkish waters is given for the first time, based on the recorded data of a subgroup of specimens (n = 34), based on the data of Kabasakal (2004) and the recent 21 specimens. The seasonality of *H. griseus* captures from Turkish waters is given based on the data of 53 specimens. The present status of sixgill shark fishery in Turkish waters is also discussed.

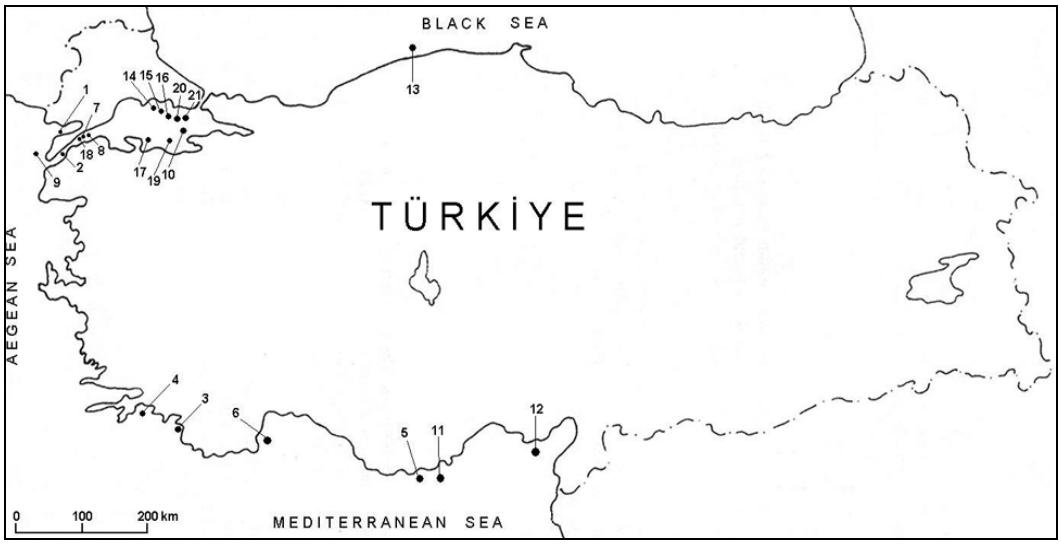

Fig. 1: Map indicating the fishing localities of 21 specimens of** H. griseus**, captured between 1998 and 2005 by means of various fishing vessels along Turkish coast. Numbers on the map are same as case Nos. in Table 1.
Sl. 1: Pomorska karta z lokacijami vzdolž turške obale, na katerih je bilo med letoma 1998 in 2005 z različnimi ribiškimi plovili ujetih 21 morskih psov šesteroškrgarjev** H. griseus**. Številke na pomorski karti so iste kot v prvem stolpcu Tabele 1.

MATERIAL AND METHODS

The present study is part of an extensive investigation on the distribution and bio-ecological aspects of *Hexanchus griseus* from Turkish waters, which has been carried out since 2000. Information on the bluntnose sixgill sharks has been obtained from the following sources: (a) examination of the specimens landed at fishing ports, (b) examination of the preserved specimens, jaws or teeth, which are kept in public museums or private collections, and (c) review of the articles on the bluntnose sixgill shark, published in scientific journals, newspapers or fishing magazines. Whenever possible, the following data have been recorded for every captured specimen: total length (TOT; Compagno, 1984), weight (W), sex, locality of capture, depth of capture and date of capture.

Length-weight relationship of 34 specimens, whose length and weight were recorded, was computed. Due to small sample size, length-weight relationship is expressed for sexes combined. Linear regression is based on the log length and log weight data.

RESULTS AND DISCUSSION

Fishing data of 21 *H. griseus* specimens, captured between 1998 and 2005, are summarised in Table 1. Capture locations of these specimens are shown in Figure 1.

Length-weight relationship

Total length (TOT) versus total weight (TW) relationship of *H. griseus* captured in Turkish waters is logTW = 2.79 × logTOT – 4.6 and r = 0.92 (n = 34, sexes combined, Fig. 2).

Maximum total length of the largest specimen captured during the present study was 600 cm, while the weight was 1000 kg (Tab. 1, case No. 7). However, as the weight of the largest specimens (500 cm TOT) captured off Naples and Sardinia did not exceed 600 kg (Capapé *et al*., 2000), the weight of the specimen No. 7 appears to be overestimated.

In a recent study by Capapé *et al*. (2003), length-weight relationship of *H. griseus* based on 29 specimens out of a total of 114 sixgill sharks, captured in different regions of Mediterranean Sea, has been computed as logTW=3.137 × logTOT – 8.6133, r = 0.957. The similarity between length-weight relationships of the present study and Capapé *et al*. (2003) is statistically significant ($p < 0.05$, student's t-test). However, with the exception of two specimens (case Nos. 14 and 26, 126 and 66 cm TOT, respectively, in Kabasakal, 2004) total lengths of the remaining 58 sixgill sharks were over 250 cm. Hence, length-weight relationship of *H. griseus* given in the present study may be assumed as representing specimens over 250 cm TOT. Therefore, morphometric data of more juveniles is required in order to calculate the length-weight relationship of the entire population.

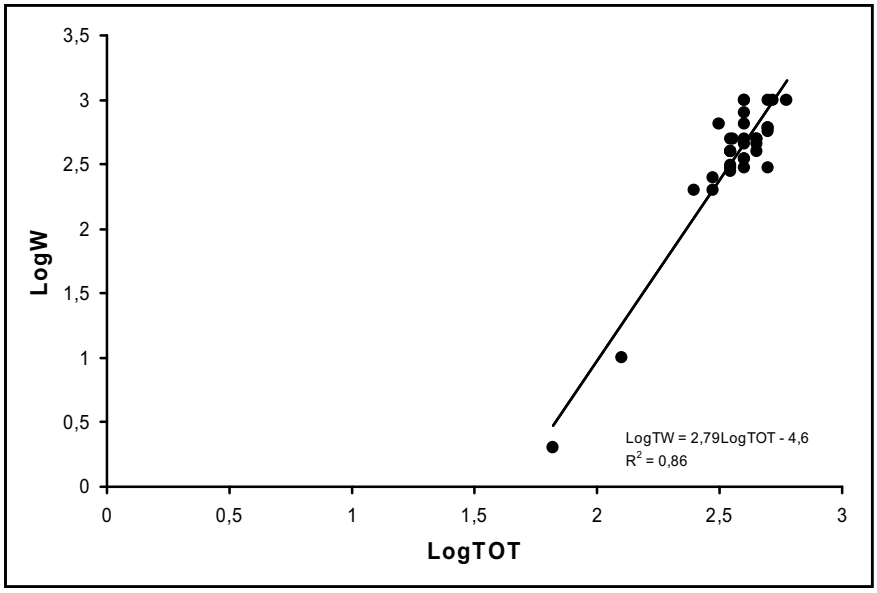

Fig. 2: Total length (TOT) vs. weight (W) relationship of** H. griseus, **captured in Turkish waters (n = 34, sexes combined).
Sl. 2: Razmerje med celotno dolžino (TOT) in težo (W) morskih psov šesteroškrgarjev, ujetih v turških vodah (n = 34, oba spola).

Tab. 1: Fishing data and observations of 21 specimens of** H. griseus**, captured between 1998 and 2005 by means of various fishing vessels along Turkish coast. Case numbers of the specimens indicate the locality of capture in Figure 1. TOT: Total length; W: Weight.
Tab. 1: Podatki o 21 morskih psih šesteroškrgarjih** H. griseus**, ujetih med letoma 1998 in 2005 z različnimi ribiškimi plovili vzdolž turške obale. Številke v prvem stolpcu ponazarjajo lokalitete ulova, kot so prikazane na Sliki 1. TOT: celotna dolžina; W: teža.

No.	Date	Locality	Fishing gear	Observations
1	20 Jul 1998	Northern Aegean Sea	Bottom-trawl	400 cm TOT, W ca. 1000 kg, sex unknown (A. Malkoçoğlu, *pers. comm.*)
2	5 Jun 1999	Dardanelle Strait	?	450 cm TOT, W (?), female, stranded specimen; (C. Boşnak, *pers. comm.*)
3	16 Feb 2001	SE Aegean Sea	Purse-seine	523 cm TOT, W 1000 kg, female, remains of swordfish (*Xiphias gladius*, ca. 6 kg) and dolphin blubber (ca. 3 kg) found in the stomach content
4	16 Mar 2001	SE Aegean Sea	Swordfish long-line	500 cm TOT, W 570 kg, female, remains of tuna (ca. 10 kg) found in the stomach content
5	16 Apr 2004	Mediterranean Sea	Trammel-net	250 cm TOT, W (?), male, remains of spurdog (*Squalus* spp., 2 dorsal fin) and squid (*Loligo* spp.) found in the stomach content
6	12 May 2004	Mediterranean Sea	?	250 cm TOT, W 200 kg, male, captured in coastal waters at a depth of ca. 75 m
7	23 Jul 2004	Marmaric entrance of Dardanelle Strait	Bottom-trawl	600 cm TOT, W ca. 1000 kg, female, remains of dolphin (ca. 3 kg) and shark (*Mustelus* spp., ca. 2 kg) found in the stomach content
8	23 Jul 2004	Marmaric entrance of Dardanelle Strait	Gill-net	500 cm TOT, W ca. 1000 kg, sex unknown, remains of dolphin (ca. 3 kg) and teleosts (Scombridae, ca. 4 kg) found in the stomach content
9	23 Sep 2004	Northern Aegean Sea	Trammel-net	450 cm TOT, W 500 kg, male, remains of hake (*Merluccius merluccius*, ca. 4 kg) found in the stomach content
10	27 Sep 2004	Sea of Marmara	Purse-seine	360 cm TOT, W 500 kg, female, remains of bonyfishes, chondrichthyans, cephalopods and dolphin found in the stomach content
11	27 Oct 2004	Mediterranean Sea	Bottom-trawl	500 cm TOT, W 600 kg, female
12	6 Nov 2004	Mediterranean Sea	Bottom-trawl	350 cm TOT, W 400 kg, female
13	19 Nov 2004	Western Black Sea	Gill-net	300 cm TOT, W 250 kg, sex unknown
14	25 Nov 2004	Sea of Marmara	Purse-seine	350 cm TOT, W 400 kg, female, remains of hake (ca. 2 kg) found in the stomach content
15	25 Nov 2004	Sea of Marmara	?	450 cm TOT, W 400 kg, sex unknown, remains of spurdog and hake found in the stomach content, caudal fin of the specimen preserved and displayed at fish market (Fig. 5)
16	29 Nov 2004	Sea of Marmara	Purse-seine	350 cm TOT, W 300 kg, female, remains of squid (ca. 3 kg) and bonyfishes found in the stomach content
17	29 Nov 2004	Sea of Marmara	Purse-seine	400 cm TOT, W 450 kg, female
18	7 Dec 2004	Marmaric entrance of Dardanelles strait	Bottom-trawl	400 cm TOT, W 300 kg, sex unknown
19	26 Dec 2004	Sea of Marmara	Gill-net	350 cm TOT, W 400 kg, sex unknown, remains of hake and clupeid bonyfishes (Clupeidae) found in the stomach content
20	12 Feb 2005	Sea of Marmara	Purse-seine	300 cm TOT, weight and sex unknown, remains of hake and horse mackerel (*Trachurus* spp.) found in the stomach content
21	20 Feb 2005	Sea of Marmara	Purse-seine	450 cm TOT, weight and sex unknown, jaws of the specimen preserved and displayed at fish market (Fig. 6)

Seasonality of captures

The combined results of the present study and Kabasakal (2004) show that sixgill sharks are captured mostly between September and March, and peaked in February as well as, although only exceptionally, in July (n = 10, in both months), when fishing is prohibited in Turkish seas (Fig. 3).

Sixgill sharks were captured primarily by means of purse-seiners and followed by trammel netters, trawlers, gill netters, and the fishing boats using shark nets and swordfish long-lines (Fig. 4).

In Turkish waters, fishing season lasts between September and May. Capture of 13 sixgill sharks between May and August, when fishing is prohibited, indicates a persisting fishing pressure on *H. griseus* throughout the year. The dates of capture of 114 sixgill sharks recorded by Capapé *et al*. (2003) show that capture of *H. griseus* in the Mediterranean spreads throughout the year, the same as in Turkish seas.

Stomach contents

Food remains were found in the stomachs of 12 sixgill sharks (57%, Tab. 1). Bony fishes, which were the main prey items, were found in 9 of the 12 stomachs (75%), followed by chondrichthyans and marine mammals (both were found in 3 stomachs (25%)), as well as cephalopods (in 2 stomachs, 17%). Hake (*Merluccius merluccius*) was the main prey (in 5 stomachs, 42%).

According to Ebert (1986), the diet of *H. griseus* primarily consists of bony fishes and chondrichthyans. Barrull & Mate (2000) found *Scyliorhinus canicula, Galeus melastomus, M. merluccius* and *Phycis blennoides* in the stomach content of a sixgill shark captured in the Catalan Sea. A spiny dogfish (*Squalus blainvillei*) was found in the stomach of a sixgill shark of 211 cm TOT, captured off the coast of Israel (Ben-Tuvia, 1971). Stomach contents of 23 sixgill sharks, captured in the eastern Sicilian waters, were dominated by bony fishes (61%), cephalopods (13%), decapod crustaceans (9%), chondrichthyans (4%) and echinoderms (4%) (Celona *et al.,* 2005). According to Kabasakal (2004), the main prey of *H. griseus* in Turkish waters were bony fishes.

Ebert (1994) reports on a close relationship between feeding of sixgill sharks and their length in South African waters. Main preys of the specimens over 200 cm TOT were marine mammals and bony fishes. In the present study, highly active and large preys such as swordfish *(Xiphias gladius),* tuna (Scombridae) and dolphin (Delphinidae) were found only in the stomach contents of sixgill sharks ≥ 500 cm TOT (Tab. 1). This indicates a clear improvement in the hunting skills of the predator with the increased length.

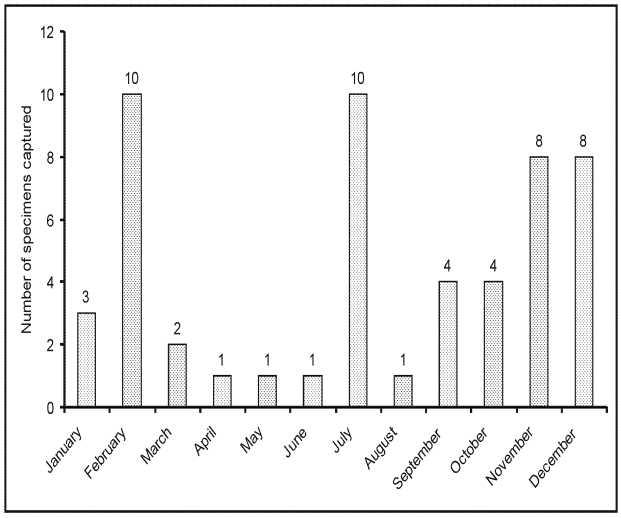

Fig. 3: The seasonality of captures of** H. griseus **in Turkish waters.
Sl. 3: Meseci, v katerih so bili vzdolž turške obale ujeti morski psi šesteroškrgarji.

Sex ratio and reproduction

Of the 60 sixgill sharks, 28 were females, 11 males and 21 of unknown sex. The sex ratio was 1:2.54 in favour of the females. This numerical dominance of females may indicate some form of sex segregation, although several adults would be required before such conclusion could be drawn.

Most of the sixgill sharks examined during the present study were eviscerated, which is the reason why gonads were not examined. The maturation state of the 21 sixgill sharks was therefore determined on the basis of the data by Capapé *et al*. (2004). According to Capapé *et al*. (2004), the Mediterranean male sixgill sharks over 300 cm TOT and females over 400 cm TOT are considered adults. Thus, the male specimen No. 9 (450 cm TOT) and females Nos. 2, 3, 4, 7 and 11 (450, 523, 500, 600 and 500 cm TOT, respectively) were considered sexually mature specimens. Based on the data by Capapé *et al*. (2004), we can on the other hand suppose that the specimen Nos. 8, 15 and 21 (500, 450 and 450 cm TOT, respectively) were also sexually mature, although their sexes were unknown.

According to Kabasakal (2004), female *H. griseus* gives birth between October and the end of February in the northern Aegean Sea and Sea of Marmara, with the young sixgill sharks occurring in coastal waters. In the present study, two young sixgill sharks (Nos. 5 and 12) were captured at depths ≤ 75 m, although more data would be required to get a better insight into the coastal occurrence of *H. griseus* in Turkish waters.

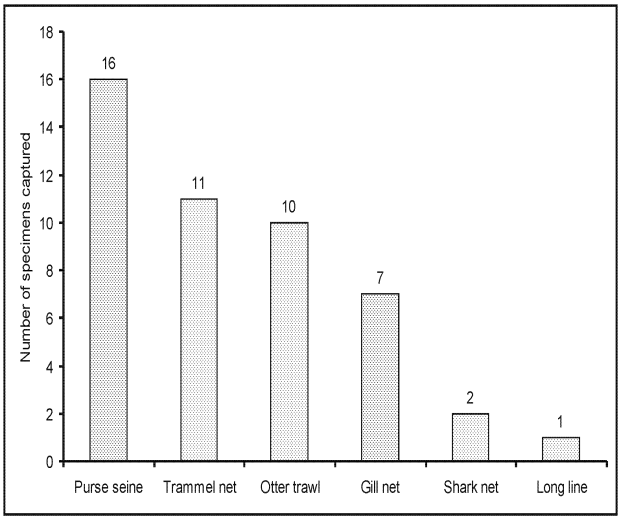

Fig. 4: Types of fishing gear and the number of by-caught sixgill sharks. The graph is based on the data of the present study and Kabasakal (2004).
Sl. 4: Ribolovna orodja in število po naključju ujetih morskih psov šesteroškrgarjev. Diagram sloni na podatkih pričujoče raziskave in študije Kabasakala (2004).

CONCLUSIONS

Regarding the geographical situation of Turkey, the waters that surround the country, *i.e.* the Mediterranean, Aegean, Marmara and Black Seas, provide an advantageous location for investigating the distribution of sharks. In the easternmost part of the Levantine Basin – İskenderun and Mersin Bays – the area contains some tropical species due to Lessepsian migration (Bilecenoğlu *et al.*, 2002); while almost the entire volume of the Black Sea consists of a brackish water body, where the oceanographical features of the area have been considered as limiting for the dispersal of sharks in the past (Akşıray, 1987).

Although the first records on the presence of *H. griseus* in Turkish waters dates back to the beginning of the 20th century (Ninni, 1923), investigations on the distribution and biology of sixgill shark has been intensified during the last decade. These recent studies yielded very important results, for example, the distributional data of the sixgill shark along the Anatolian coast of the Aegean and Mediterranean Seas, while those from Marmaric waters were updated and those on the species' Pontic occurrence clarified. Today, our knowledge of the sixgill shark from Turkish waters is much greater than ever before and we are doing everything to increase it still further.

As in many other shark species, the study of *H. griseus* has been neglected on the account of commercially more important bony fishes. *H. griseus* is not consumed by humans in Turkey. It is a rare by-catch by Turkish fishermen and incidentally captured specimens are generally landed for display. Public interest in large sharks is the main reason of landings, in addition to fishermen anticipating an extra benefit from incidentally captured sharks. However, in most cases the displayed sixgill sharks are discarded in a couple of days, due to their rapid putrefaction. Incidental captures of sixgill sharks create artificial fishing pressures on the species, which also persist between May and August, the prohibited season of fishery. Insensitivity of both public and fisheries' authorities to the conservation of sharks is still present in Turkey. One of the main reasons of this circumstance is the absence of biological information, relevant to set regulations for the management of shark fishery in Turkish waters. Sixgill shark is considered "vulnerable" in the published Red List of IUCN/SSG (Soldo, 2003). Therefore, the author expects that results of the recent research will contribute to the implementation of an effective conservation strategy for *H. griseus* as soon as possible.

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RAZŠIRJENOST IN BIOLOGIJA MORSKEGA PSA ŠESTEROŠKRGARJA, *HEXANCHUS GRISEUS* (BONNATERRE, 1788) (CHONDRICHTHYES: HEXANCHIDAE), V TURŠKIH VODAH

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POVZETEK

Hexanchus griseus *(Bonnaterre, 1788) je redka prilovna vrsta v turških vodah. Avtor podaja razmerje med celotno dolžino in težo pri morskih psih šesteroškrgarjih, ujetih v turških vodah. Ti morski psi so ujeti predvsem med septembrom in marcem, z vrhuncem v februarju, v izjemnih primerih pa tudi v juliju (n = 10 v obeh mesecih), ko je ribarjenje sicer prepovedano. V obdobju, ko ribolov ni dovoljen, je največ morskih psov šesteroškrgarjev ujetih s protizakonito upravljanimi kočami in mošnjačami, na kopnem pa naključno ujete primerke potem razstavljajo zgolj zaradi atrakcije in zanimanja medijev. To pa seveda pomeni, da je* H. griseus *pod ribolovnim pritiskom skozi vse leto. Morski psi šesteroškrgarji so bili ujeti predvsem z mošnjačami. Njihov glavni plen so sestavljale ribe kostnice, saj so bile najdene v 9 od 12 odprtih želodcev teh morskih psov (75%). Razmerje med spoloma je bilo 1 : 2,5 v korist samic. Ta številčna prevlada samic kaže na obliko spolne segregacije, vendar pa bi potrebovali več odraslih osebkov, da bi to domnevo lahko tudi potrdili.*

Ključne besede: *Hexanchus griseus*, morski pes šesteroškrgar, razširjenost, biologija, turške vode, prilov

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ON A RARE SKATE, THE SPECKLED RAY, *RAJA POLYSTIGMA* REGAN, 1923 (CHONDRICHTHYES: RAJIDAE) CAPTURED OFF THE COAST OF LANGUEDOC (SOUTHERN FRANCE, NORTHERN MEDITERRANEAN)

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ABSTRACT

The capture of a rare skate, the speckled ray Raja polystigma *Regan, 1923 off the coast of Languedoc (the first record since 1965 in the area), is presented in this paper. A short description of the specimen and a brief comment on the occurrence of the species in the area are given.*

Key words: Chondrichthyes, Rajidae, *Raja polystigma*, coast of Languedoc, France, Mediterranean Sea

CATTURA DI UNA RAZZA RARA, LA RAZZA POLISTIMMA, *RAJA POLYSTIGMA* REGAN, 1923 (CHONDRICHTHYES: RAJIDAE) AL LARGO DELLA COSTA DI LANGUEDOC (FRANCIA MERIDIONALE, MEDITERRANEO SETTENTRIONALE)

SINTESI

L'articolo riporta la cattura di una razza rara, la razza polistimma Raja polystigma *Regan, 1923 al largo della costa di Languedoc. Si tratta della prima segnalazione della specie per quest'area dal 1965. Gli autori forniscono una corta descrizione dell'individuo catturato ed un breve commento sull'evidenza della specie nell'area di ricerca.*

Parole chiave: Chondrichthyes, Rajidae, *Raja polystigma*, costa di Languedoc, Francia, mare Mediterraneo

INTRODUCTION

Of the 12 rajid species previously reported off the coast of Languedoc (southern France, northern Mediterranean, see Quignard, 1965), only two have been recorded to date, the starry ray *Raja asterias* Delaroche, 1809 and the thornback ray, *R. clavata* Linnaeus, 1758, based on the observations carried out from 1988 till today. Recent investigations have confirmed the capture of a speckled ray *R. polystigma* Regan, 1923, which is considered a very rare species in the area (Quignard, 1965). This specimen is described in the present paper, with its Mediterranean occurrence commented and discussed upon.

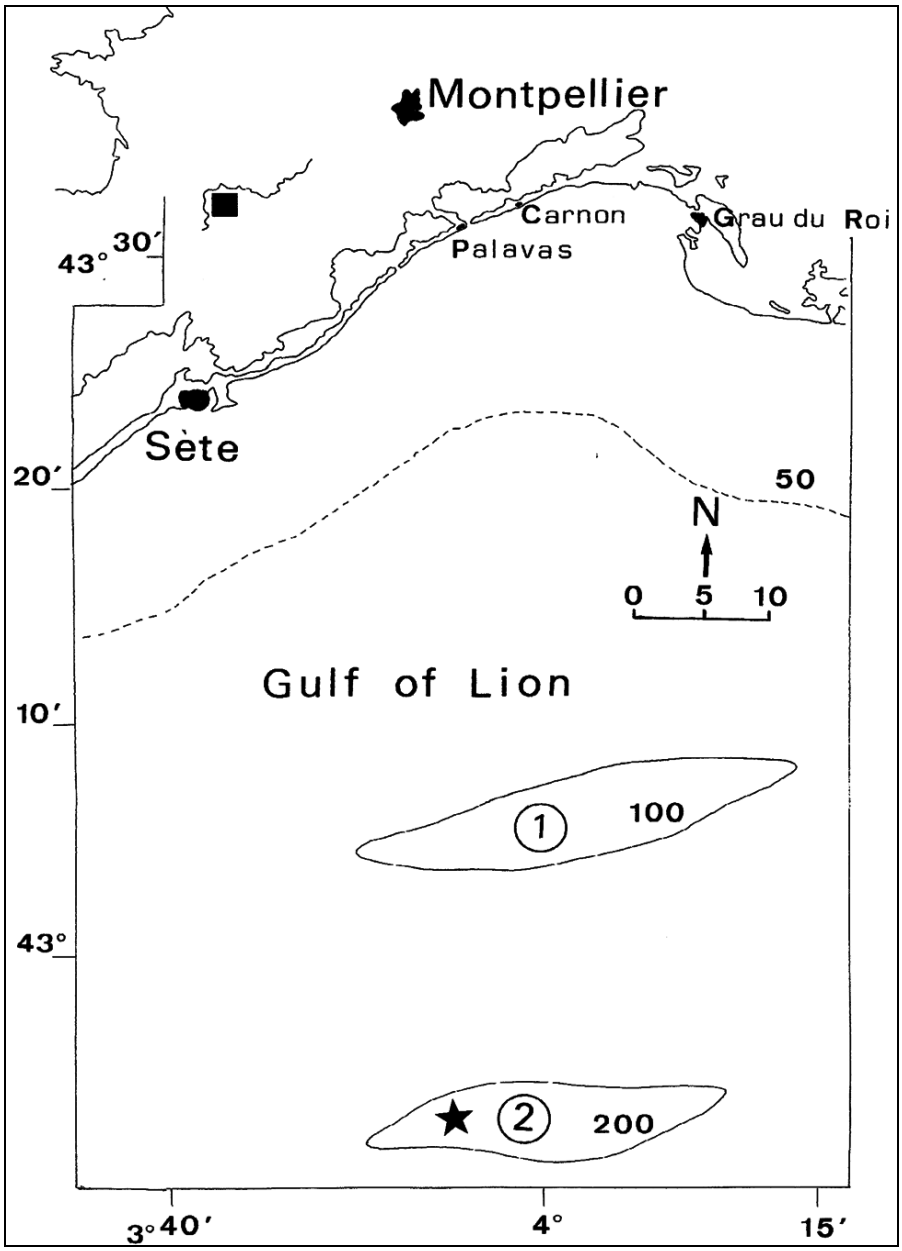

Fig. 1: Map of France with the coast of Languedoc and the capture site of *Raja polystigma* ***in the 'pits' from off Sète where the small spotted catshark,*** *Scyliorhinus canicula* ***① and the blackmouth catshark*** *Galeus melastomus* ***② are the dominant elasmobranch species (redrawn from Capapé*** *et al.*, ***2000).***
Sl. 1: Zemljevid Francije z obalo province Languedoc in lokaliteto, na kateri je bila ujeta *Raja polystigma*, ***in sicer v eni izmed "jam" v bližine Sèteja, kjer iz podrazreda morskih psov in skatov prevladujeta navadna morska mačka*** *Scyliorhinus canicula* ***① in morska mačka vrste*** *Galeus melastomus* ***② (po Capapé*** *et al.*, ***2000).***

RESULTS

The Languedocian specimen was caught on 9 May 2006 by a trawler off the coast of Languedoc between Sète and Palavas (Fig. 1), on muddy-sandy bottom at depths between 150 and 200 m, together with several specimens of the blackmouth catshark, *Galeus melastomus* (Fig. 2). The specimen was preserved in 5% buffered formalin solution and deposited in the Ichthyological Collection of the Laboratoire d'Ichtyologie de l'Université Montpellier II, Sciences et Techniques du Languedoc, under Cat. No Raj. poly. 1 (Fig. 2).

The measurement method and counts follow Regan (1923), Clark (1926), Tortonese (1956), Bini (1967), Hulley (1972), Capapé *et al.* (1980) and Mejri *et al.* (2004). They are summarized in Table 1.

Disk sub-quadrangular, obtuse in front, with snout slightly marked and rounded, anterior margin slightly concave at level of eyes and outer corners; outer angles broadly rounded; posterior margins convex. Pelvic quite separate from pectoral fins, bilobed with anterior lobe connected with posterior lobe along outer margin of fin. First dorsal larger than second dorsal.

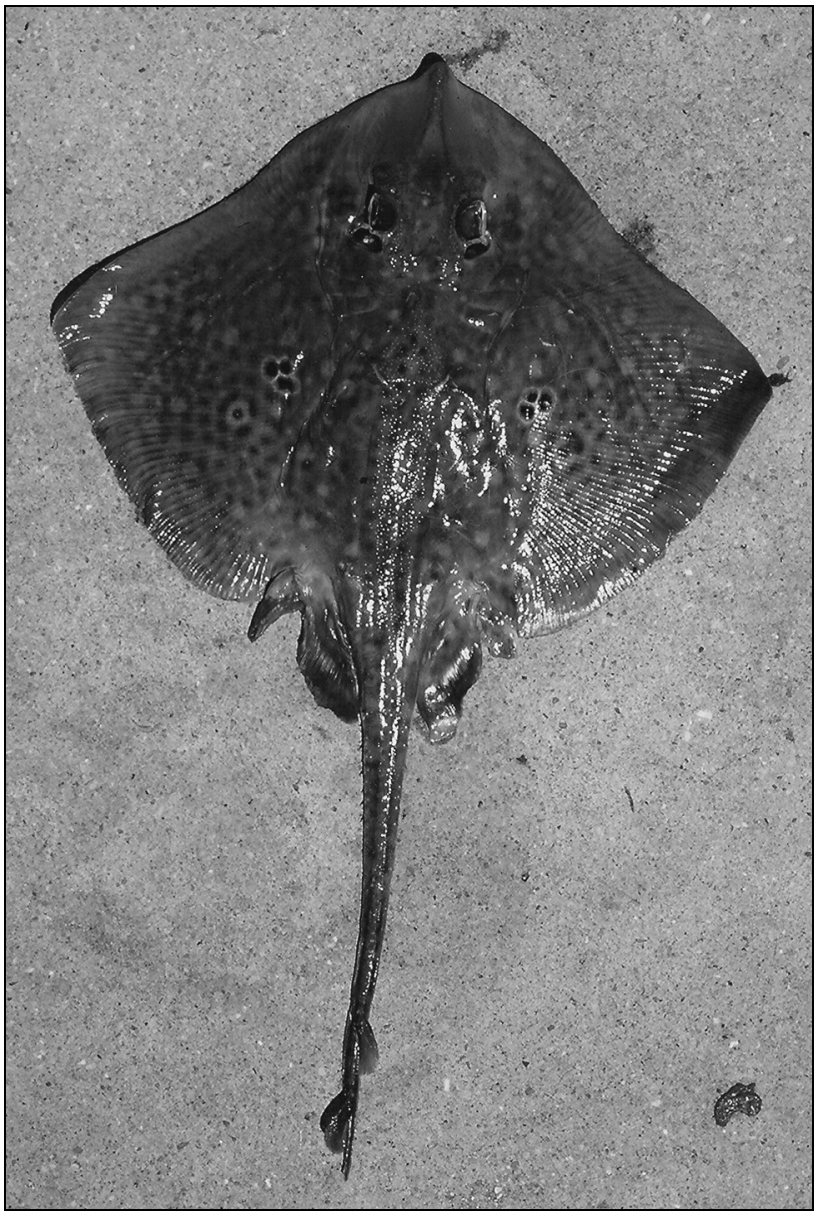

Fig. 2: *Raja polystigma* ***(Ref: Raj. poly. 1) captured off the coast of Languedoc.***
Sl. 2: *Raja polystigma* ***(Ref: Raj. poly. 1), ujeta v obrežnih vodah Languedoca.***

Tab. 1: Total mass (g), measurements (mm) with percentages of disk-width, and other morphological parameters of** Raja polystigma **caught off the coast of Languedoc.
Tab. 1: Skupna masa (g), mere (mm) z odstotki širine diska, in drugi morfološki parametri pri raži** Raja polystigma**, ujete v obrežnih vodah francoske regije Languedoc.

Reference	**Raj. poly. 1**	
Total mass (g)	883	
Measurements	**mm**	**% DW**
Total length	570	1.7
Disk-length	262	0.5
Disk-width (DW)	340	1.0
Disk-depth	20	0.06
Eyeball length	25	0.07
Cornea	22	0.06
Pre-orbital length	63	0.18
Inter-orbital width	50	0.15
Spiracle length	17	0.05
Spiracle width	11	0.03
Inter-nasal width	53	0.16
Nasal curtain	40	0.11
Inter-spiracular width	45	0.13
Pre-oral length	80	0.23
Mouth width	44	0.13
First gill slit	24	0.07
Second gill slit	24	0.07
Third gill slit	24	0.07
Fourth gill slit	24	0.07
Fifth gill slit	23	0.07
Width between first gill slit	74	0.22
Width between fifth gill slit	60	0.18
Snout tip to eye	70	0.21
Snout tip to mouth	92	0.27
Snout tip to first gill slit	140	0.41
Snout tip to fifth gill slit	176	0.52
Snout tip to pelvic fin	240	0.71
Snout tip to vent	260	0.76
Pectoral fin anterior margin	230	0.68
Pectoral fin posterior margin	193	0.57
Pectoral fin inner margin	49	0.14
Pelvic fin anterior margin	53	0.16
Pelvic fin posterior margin	48	0.14
Pelvic fin inner margin	44	0.13
Span of pelvic fins	96	0.28
Tail base width	65	0.19
Tail base depth	22	0.06
Tail length	270	0.79
Snout tip to first dorsal	460	1.35
Snout tip to second dorsal	497	1.46
Superior caudal edge	32	0.09
Inferior caudal edge	33	0.09
First dorsal anterior edge	33	0.09
First dorsal posterior edge	34	0.1
First dorsal base	22	0.06
Second dorsal anterior edge	33	0.09
Second dorsal posterior edge	32	0.09
Second dorsal base	23	0.06
Inter-dorsal distance	39	0.08
Second dorsal to caudal birth	41	0.12
Counts		
Tooth rows	58/60	
Pectoral rays	56	
Trunchal vertebrae	28	
Pseudobranchial lamellae	16	
Nictitating eye lamellae	12	

Disk-depth 7.0%, disk-length 77.1%, pre-oral length 23%, pelvic span 28%, pelvic fin anterior margin 16%, all in disk-width. Pre-orbital length 1.26 times, width between first gill slits 1.48 times, width between fifth gill slits 1.2 times interorbital width.

Dorsal surface greyish-brownish with dark and whitish spots, generally the latter being surrounded by the former. On each middle part of disk, one eye-spot formed by three black spots (two anterior, one posterior) surrounded by white edge. Belly beige with outer margin of disk slightly brownish.

Dorsal and ventral surfaces entirely smooth except on rostrum and anterior margin of pectoral fins, while tail entirely granulous on both surfaces. Tail width a medial row of 26 thorns before first dorsal fin, and one row of 25 thorns on each tail side, two thorns on interdorsal fins space.

DISCUSSION

Raja polystigma is probably endemic to Mediterranean Sea (Capapé, 1989), and was reported in some areas such as the Catalan Sea (Matallanas, 1977), off Toulon (southern France, see Capapé, 1977), Italian seas (Tortonese, 1956; Arbocco, 1966), off Greece (Economidis, 1973; Kaspiris, 1974), Algeria (Dieuzeide *et al.*, 1953) and the Tunisian coast (Capapé & Quignard, 1978; Capapé *et al.*, 1980; Bradaï *et al.*, 2004). In this latter area only, *R. polystigma* was abundantly captured and its reproductive biology was studied by Capapé & Quignard (1978) and Capapé (1980). The Languedocian specimen, 340 mm DW, was probably an adult female, although we have not dissected it.

Off the Languedocian coast, no specimen was available for confirmation. Measurements and counts of this specimen are in agreement with Regan (1923), Clark (1926), Tortonese (1956), Quignard (1965), Bini (1967) and Capapé *et al.* (1980).

Disappearance of rajid species off the coast of Languedoc is due to fishing pressure such as in other marine areas (Du Buit, 1989; Dulvy & Reynolds, 2002; Garofalo *et al.*, 2003), considering that skates are the most vulnerable exploited fish related to their morphology and life-history.

No *R. polystigma* has been recorded off the coast of Languedoc since 1965 (see Quignard, 1965), the capture of the specimen did not suggest a recovery of the species in the area, but it occurred in deep biotope previously unexploited by usual fishing methods according to information provided by fishermen.

O REDKI RAŽI VRSTE *RAJA POLYSTIGMA* REGAN, 1923 (CHONDRICHTHYES: RAJIDAE), UJETI V OBREŽNIH VODAH LANGUEDOCA (JUŽNA FRANCIJA, SEVERNO SREDOZEMLJE)

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POVZETEK

Prispevek obravnava primerek redke raže vrste Raja polystigma *Regan, 1923, ujete v vodah francoske regije Languedoc (prvi zapis vse od leta 1965 v tem območju). Predstavljena sta kratek opis primerka in jedrnat komentar o pojavljanju vrste v tem delu Sredozemskega morja.*

Ključne besede: Chondrichthyes, Rajidae, *Raja polystigma*, obrežne vode Languedoca, Francija, Sredozemsko morje

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ON THE OCCURRENCE OF BUTTERFISH, *STROMATEUS FIATOLA* LINNAEUS, 1758, IN THE EASTERN ADRIATIC SEA: A REVIEW

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ABSTRACT

The butterfish Stromateus fiatola *specimen (total length TL=46.8 cm, weight W=1320.8 g, ♂) was caught near Klek (southern Adriatic, Croatian coast). According to the previous records of the species in the Adriatic Sea, it may be stated that it is rare in the area. The main morphometric and meristic data are given.*

Key words: *Stromateus fiatola*, occurrence, rarity, eastern Adriatic

REVISIONE DEI RITROVAMENTI DI LECCIA BASTARDA, *STROMATEUS FIATOLA* LINNAEUS, 1758, IN ADRIATICO ORIENTALE

SINTESI

Nel novembre 2005 è stato catturato un esemplare di leccia bastarda Stromateus fiatola *(lunghezza totale = 46,8 cm, peso = 1320,8 g, ♂) nelle acque costiere vicino a Klek (Adriatico meridionale, costa croata). In accordo con le segnalazioni passate di tale specie nel mare Adriatico, gli autori la definiscono rara in quest'area. Nell'articolo vengono riportati i principali dati morfometrici e meristici.*

Parole chiave: *Stromateus fiatola*, ritrovamento, rarità, Adriatico orientale

INTRODUCTION

The butterfish, *Stromateus fiatola* Linnaeus, 1785, is a benthopelagic marine fish occurring at depths ranging from 10 to 70 m. It occurs along the Atlantic coasts from the Bay of Biscay (rare) southward to the Cape of Good Hope, and in the Mediterranean (not in Adriatic) (Haedrich, 1986). Jardas (1985, 1996) reported on its presence in the Adriatic Sea (fairly rare), while Haedrich (1986) excluded its presence in the Adriatic. Young specimens are often found associated with pelagic medusae, forming large shoals (Jardas, 1996). It feeds on small fishes, zooplankton and medusae (Haedrich, 1986).

There are no data available on biology and ecology of this species in the Adriatic Sea. The aim of this paper is to present data regarding the new record of butterfish in the eastern Adriatic (with a review of Adriatic records) and its morphometric and meristic characters.

MATERIAL AND METHODS

The butterfish specimen (total length TL=46.8 cm, weight W=1320.8 g, ♂) (Fig. 1) was caught by gill-net on 9th November 2005 near the village of Klek (southern Adriatic, Croatian coast) (Fig. 2) at a depth of 10 m on rocky-muddy bottom. The specimen was identified according to Šoljan (1975). It was subsequently measured to the nearest 0.1 cm and weighed to the nearest 0.1 g. The meristic characters considered were dorsal, anal and pectoral fins. It is deposited in the Ichthyological Collection of the Institute of Oceanography and Fisheries in Split, Croatia (IOR-300).

Fig. 1: Specimen of the butterfish *S. fiatola* ***(♂, TL = 46.8 cm).***
Sl. 1: Primerek fige *S. fiatola* ***(♂, celotna dolžina = 46,8 cm).***

RESULTS AND DISCUSSION

In Table 1, the main morphometric and meristic data are given. The meristic characteristics of butterfish are in agreement with data by Haedrich (1986), *i.e.* D 42-50, A 33-38, P 21-25.

Description of the Adriatic specimen

The specimen has a deep compressed body. Eyes and mouth are small, dorsal fin single and long based, longer than the similar anal fin. Anterior rays are longer than those that follow, but fins are not falcate. Pectoral fins are broad and wing-like, but not prolonged, while pelvic fins are absent. Colour is generally bluish on the back and whitish on the sides and below, overall with a silver tinge.

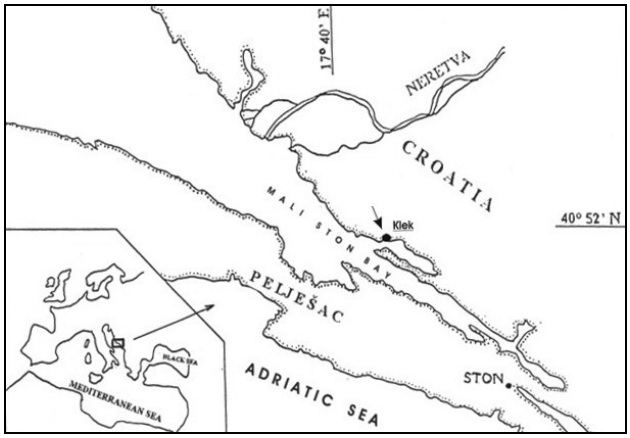

Fig. 2: Site where the specimen of *S. fiatola* ***was caught (Klek, southern Adriatic).***
Sl. 2: Lokaliteta ujetega primerka fige *S. fiatola* ***(Klek, južni Jadran).***

Graeffe (1888) reported on the presence of butterfish at the Trieste fish market and their occurrence together with the jellyfish *Rhizostoma pulmo* L. The first record of the butterfish was made near Rijeka on 16th July 1896 (Langhoffer, 1903). Other records were made in the Neretva Channel on November 20, 1944 (Onofri, 1997), in the Trpanj area (Pelješac peninsula) on February 2, 1996 (Pallaoro & Jardas, 1996), in the Dubrovnik area (without data on date of capture) (Mušin, 1989) and in the Vis channel (without data on date of capture) (Onofri, 1983). The first record of a juvenile butterfish was made near Stončica, Vis Island, on 23rd September 1998 (Dulčić *et al.,* 2000).

This record could possibly be connected with the findings of huge quantities of jellyfishes: *R. pulmo, Pelagia noctiluca, Cotylorhiza tuberculata* and *Aurelia aurita* in 2005 along the entire eastern Adriatic coast (D. Lučić, *pers. comm.*), since they constitute a very significant component of the species' diet. An unusual occurrence of such rarely found fish could be related to the changes in climate and/or oceanographic conditions (Quigley, 1985; Dulčić *et al.*, 1999). The penetration and occurrence of the species may also be connected with some special oceanographic conditions and input of intermedian waters (50–100 m) in the Adriatic (Adriatic ingres-

sions), which influenced the increase in salinity and temperature. Furthermore, Pallaoro (1988) stated that the Adriatic ingressions caused more rare species to appear in the central Adriatic region in the 1986–87 period.

Tab. 1: Morphometric (in cm) and meristic data of the butterfish specimen (♂) in the southern Adriatic.
Tab. 1: Morfometrični (v cm) in meristični podatki o primerku fige (♂), ujete v južnem Jadranu.

Weight (W) (g)	1320.8
Weight of gonads (g)	9.1
Morphometric characters (cm)	
Total length (TL)	46.8
Standard length (SL)	34.0
Head length (Lc)	13.0
Predorsal length (Lpd)	13.4
Preanal length (Lpa)	15.3
Prepectoral length (Lpp)	9.1
Dorsal fin length (Ld)	18.8
Anal fin length (La)	17.2
Pectoral fin length (Lp)	5.1
Caudal fin length (Lc)	7.8
Maximal body height (Tmax)	17.6
Minimal body height (Tmin)	3.0
Eye diameter (O)	1.0
Interorbital length (Io)	3.0
Preorbital length (Po)	2.4
Meristic characters	
Dorsal fin (D)	44
Pectoral fin (P)	23
Anal fin (A)	33

It could be pointed out that the term 'rarity' is a subjective and elastic term varying with place and, moreover, is subject to change with our increasing knowledge of the fauna. According to Morović (1974), the rarity of certain fish species could be evaluated from the records in scientific literature. The same author proposed three possibilities regarding the term rarity: a) if a species is recorded less than five times, it should be treated as a very rare species, b) if there are up to ten records, the species should be considered rare, and c) a fish species caught in certain areas and only during specific season should be treated as fairly rare. If we take this evaluation into consideration, then the butterfish is a rare species in the Adriatic Sea. Although such species may not be very important for community metabolism and some other functional properties, they may constitute the largest component of species richness (Putman, 1994). Santos *et al*. (2002) noted that *S. fiatola* was a very rare species off the Algarve (southern Portugal); while Haedrich (1986) stated that it was rare in the Bay of Biscay. Papaconstantinou (1988) reported on the rarity of *S. fiatola* in Greek waters. It thus appears that this species is rare in the above mentioned areas, but more abundant in the areas southward from Morocco to the Cape of Good Hope (South Africa) (Haedrich, 1986). We may conclude that the rarity of the butterfish in the Adriatic Sea is not connected with the use of inappropriate fishing gears, but that we are dealing with a truly rare species.

The status of butterfish needs to be evaluated on a continuous basis as it is becoming increasingly apparent that uncommon species, and particularly those on the edge of their distribution, can be essential indicators of environmental changes.

O POJAVLJANJU FIGE, *STROMATEUS FIATOLA* LINNAEUS, 1758, V VZHODNEM JADRANSKEM MORJU: PREGLED

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POVZETEK

Novembra 2005 je bila v hrvaških obrežnih vodah blizu vasi Klek (južni Jadran) ujeta figa Stromateus fiatola *(ce-*

lotna dolžina = 46,8 cm, teža = 1320,8 g, ♂). Glede na prejšnje podatke o tej vrsti v Jadranskem morju gre za bržkone redko vrsto v tem območju. Podani so glavni morfometrični in meristični podatki ujetega primerka.

Ključne besede: *Stromateus fiatola*, pojavljanje, redkost, vzhodni Jadran

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PRESENZA DELLA BALENOTTERA COMUNE *BALAENOPTERA PHYSALUS* (LINNAEUS, 1758) NELL'AREA DI LAMPEDUSA (ARCIPELAGO DELLE PELAGIE) IN RELAZIONE ALLA TEMPERATURA SUPERFICIALE DELLE ACQUE

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SINTESI

Si presentano i dati raccolti tra il 2002 ed il 2005 relativi alla presenza della balenottera comune (Balaenoptera physalus) *nelle acque che circondano l'isola di Lampedusa mettendoli in relazione con le caratteristiche delle batimetrie e delle temperature superficiali. Dall'analisi dei dati emerge chiara come la presenza della specie in determinate zone dell'area oggetto di studio sia collegata in particolare alla temperatura superficiale dell'acqua. Inoltre appare confermato che tale specie utilizzi le acque del versante sud dell'isola per nutrirsi.*

Parole chiave: *Balaenoptera physalus*, temperatura, trofismo, Lampedusa, Mediterraneo

OCCURRENCE OF THE FIN WHALE *BALAENOPTERA PHYSALUS* (LINNAEUS, 1758) IN THE WATERS OF LAMPEDUSA (PELAGIE ARCHIPELAGO) IN RELATION TO THE SUPERFICIAL TEMPERATURE OF THE SEA

ABSTRACT

The article presents the data collected during the 2002–2005 period on the presence of fin whale (Balaenoptera physalus) *in the Pelagie Archipelago, associating them with the bathymetry characteristics and superficial water temperatures. The analysis of the gathered data has shown that the species' occurrence in certain parts of the area under consideration is closely associated with the superficial temperature of the water. The supposition that the species feeds in the waters south of the island has also been confirmed.*

Key words: *Balaenoptera physalus*, temperature, trophism, Lampedusa, Mediterranean

INTRODUZIONE

La balenottera comune *(Balaenoptera physalus)* è il più grande misticeto del Mediterraneo e, dopo la balenottera azzurra *(Balaenoptera musculus),* è il più grande animale del pianeta (Notarbartolo di Sciara & Demma, 2004). All'interno del nostro bacino appare più abbondante nell'area occidentale e centrale mentre nella parte orientale la sua presenza è più sporadica. Nei mari che circondano l'Italia è particolarmente frequente e sembra essere, assieme alla stenella *(Stenella coeruleoalba),* il cetaceo più comunemente osservato in estate (Di Natale & Mangano, 1983, 1985; Notarbartolo di Sciara *et al.*, 2003).

Da pochi anni nell'area dell'Arcipelago delle Pelagie ne viene studiata la presenza nei mesi da febbraio ad aprile da parte di diversi enti di ricerca (ICRAM – Istituto Centrale per la Ricerca scientifica e tecnologica Applicata al Mare; NURC-NATO Undersea Research Centre; Necton Marine Research Society). Sembra infatti che in questo periodo, grazie al manifestarsi di particolari condizioni climatiche strettamente legate all'aumento delle temperature superficiali, risulti un'area di alimentazione molto importante ma ancora poco studiata. Dalle osservazioni degli anni precedenti e dalle interviste effettuate è nata la necessità di confrontare la presenza di questa specie con l'andamento di questo rilevante parametro.

MATERIALI E METODI

Durante il quadriennio 2002–2005 sono stati raccolti dati relativi alla presenza della balenottera comune nell'area dell'isola di Lampedusa. I dati si riferiscono ad un numero di 58 individui appartenenti a 12 gruppi (Tab. 1). Gli avvistamenti sono stati effettuati in parte nel corso di imbarchi su pescherecci che praticano la pesca con reti a circuizione per piccoli pelagici *(Scomber scombrus, S. japonicus, Sarda sarda, Engraulis encrasicolus)* e su altre barche che effettuano la pesca con palangari per grandi pelagici *(Thunnus thynnus, Xiphias gladius, Thunnus alalunga)* ed in parte durante l'attività di monitoraggio svolta dagli autori sulla presenza dei mammiferi marini in queste acque.

Per la relazione tra la presenza delle balenottere e la temperatura superficiale sono state utilizzate delle carte nautiche dell'Istituto Idrografico della Marina Militare geo-referenziate con il programma OziExplorer. Successivamente tali carte sono state confrontate con le mappe di temperatura superficiale acquisite dagli archivi del NOAA – National Oceanic and Atmospheric Administration, Satellite Information System.

Nonostante le scarse possibilità economiche (la nostra ricerca è completamente auto finanziata) abbiamo avuto la possibilità (grazie alle mappe messe a disposizione dal NOAA) di trovare una chiara relazione tra la temperatura superficiale e la presenza della balenottera in quest'area.

RISULTATI E DISCUSSIONE

Dall'analisi dei dati è emerso che nel corso degli anni lo spostamento degli animali varia in stretta relazione all'andamento delle temperature superficiali. Confrontando la posizione degli individui osservati sulle carte nautiche (Figg. 1, 3, 5, 7) e le mappe di temperatura rilevata dal satellite (Figg. 2, 4, 6, 8), relative agli stessi periodi, è visibile tale relazione.

E' da rilevare che lo spostamento degli animali durante gli anni si registra in un periodo compreso tra febbraio ed aprile ed a distanze dalla costa che variano notevolmente da un anno all'altro (Tab. 1). Questa variabilità spazio-temporale è da mettere in stretta relazione con le variazioni della temperatura superficiale.

E' ormai accertato che la specie in oggetto transita e sosta (anche se per periodi piuttosto brevi) in quest'area a scopo trofico (Canese *et al.*, 2006). Durante le osservazioni si è avuto modo di osservare alcuni individui mentre si cibavano predando densi sciami degli eufasiacei *Meganyctiphanes norvegica* e *Nyctiphanes couchi* che rappresentano le prede più importanti per *B. physalus* nel bacino del Mediterraneo (Giusti *et al.*, 2005).

La formazione di questi sciami avviene in concomitanza con un aumento esponenziale della produzione primaria che, secondo noi, è in relazione con l'aumento delle temperature superficiali. Tale affermazione trova conferma nel lavoro di diversi autori tra cui Ryther (1956). La nostra ipotesi ha trovato conferma nel corso del 2005 quando, a differenza del triennio precedente, le temperature superficiali sottocosta sono risultate inferiori determinando una diminuzione della produzione e di conseguenza la permanenza in aree molto più distanti dalla costa lampedusana degli individui di *B. physalus* rispetto agli anni precedenti come si osserva nella figura 7 che riporta i punti di avvistamento. Tali avvistamenti sono stati effettuati ad una distanza media dalla costa di 17,78 Nm.

Analizzando le mappe relative agli avvistamenti e confrontandole con le cartine di temperatura superficiale relative agli anni precedenti si notano in prossimità dell'area dell'arcipelago delle Pelagie temperature percettibilmente più elevate caratterizzate da una colorazione gialla a cui corrisponde una conseguente distribuzione spaziale degli individui. La distanza media dalla costa a cui sono stati effettuati gli avvistamenti nel periodo 2002–2004 è stata di 0,81 Nm.

Tab. 1: Avvistamenti di** Balaenoptera physalus **nel periodo 2002–2005. Le coordinate riportate si riferiscono all'individuo occupante la posizione mediana all'interno del gruppo.
Tab. 1: Opazovanja brazdastega kita** Balaenoptera physalus **v letih 2002–2005. Koordinate označujejo pozicijo osebka, ki zaseda osrednjo točko v skupini.

Data	Ora	Lat. (N)	Long. (E)	No. individ. / gruppo	Distanza dalla costa (Nm)
03/03/2002	17.10	35°30,19′	12°32,14′	4	0,85
28/03/2002	15.00	35°29,37′	12°36,87′	6	0,58
22/02/2003	14.20	35°29,22′	12°36,12′	4	0,73
24/02/2003	15.35	35°28,80′	12°37,96′	2	1,06
02/03/2004	8.37	35°30,55′	12°39,80′	10	1,41
07/03/2004	15.20	35°31,67′	12°35,96′	1	0,21
08/03/2004	11.24	35°31,88′	12°38,46′	5	0,86
18/03/2005	16.10	35°16,32′	12°43,03′	5	14,47
19/03/2005	14.40	35°10,41′	12°58,17′	3	25,55
21/03/2005	12.26	35°14,68′	12°27,28′	10	11,46
23/03/2005	15.35	35°08,24′	12°56,73′	6	26,67
02/04/2005	13.15	35°25,75′	12°48,89′	2	10,77

Nel corso delle osservazioni, si è avuto modo di registrare la presenza di altre specie in compagnia delle balenottere; in 4 casi è stata osservata la presenza di *Tursiops truncatus*, mentre in un caso abbiamo osservato alcuni individui di *Stenella coeruleoalba*.

Ci è sembrato interessante inserire questo dato poiché la presenza di *T. truncatus* (specie sostanzialmente costiera) è da mettere in stretta relazione con la breve distanza dalla costa alla quale transitavano le balenottere in quegli anni. Osservando le cartine degli stessi periodi si nota la breve distanza dalla costa alla quale è avvenuto il transito. Per ciò che concerne l'altra specie *(S. coeruleoalba)* si è avuto modo di osservarla soltanto una volta nel corso degli avvistamenti 2004 quando alcuni individui transitavano in compagnia delle balenottere in un tratto di mare a est dell'isola dove spesso si osservano questi piccoli delfinidi in compagnia di *T. truncatus* e di *Delphinus delphis*.

La netta differenza tra i fondali a Sud (sostanzialmente sabbiosi e con batimetrie che raramente superano i 50–60 metri) e quelli a Nord, Nord-ovest e Nord-est (fondali rocciosi che scendono rapidamente) dell'isola favoriscono la presenza di alcune specie piuttosto che di altre; le specie normalmente costiere come *T. truncatus* vengono osservate soprattutto nella parte sud, mentre altre specie tipicamente pelagiche come *S. coeruleoalba* ed *D. delphis* si osservano quasi esclusivamente negli altri versanti dell'isola.

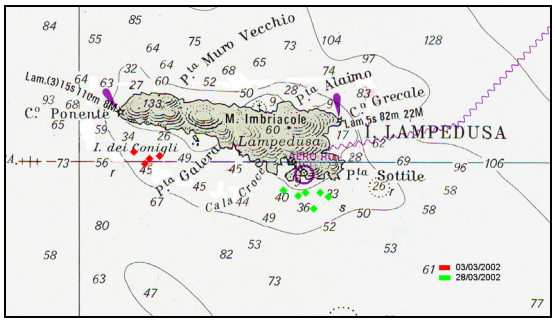

Fig. 1: Avvistamenti di** Balaenoptera physalus **nel 2002.
Sl. 1: Opazovanja brazdastega kita** Balaenoptera physalus **v letu 2002.

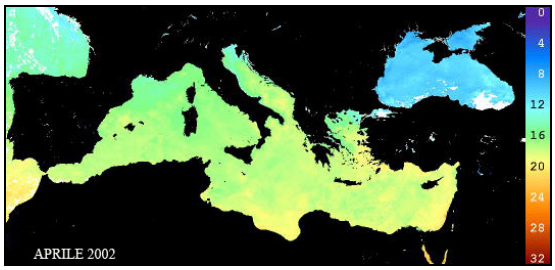

Fig. 2: Media delle temperature superficiali mediterranee nell'aprile 2002 (NOAA Satellite Information Service).
Sl. 2: Povprečna površinska temperatura Sredozemskega morja v aprilu 2002 (NOAA Satellite Information Service).

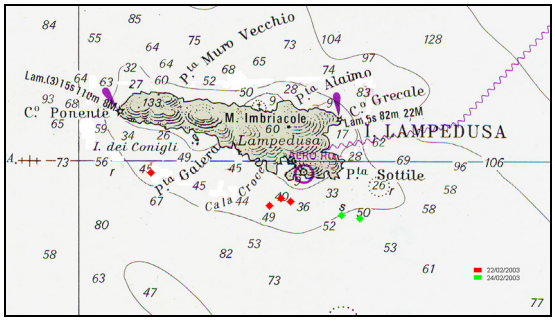

Fig. 3: Avvistamenti di** B. physalus **nel 2003.
Sl. 3: Opazovanja brazdastega kita v letu 2003.

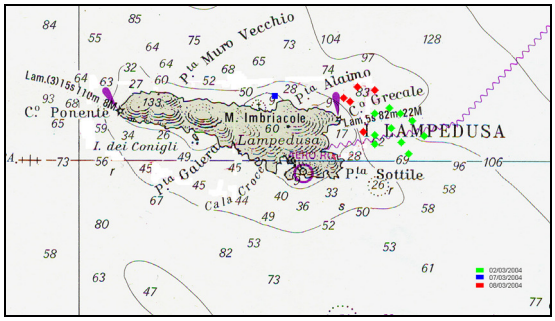

Fig. 5: Avvistamenti di** B. physalus **nel 2004.
Sl. 5: Opazovanja brazdastega kita v letu 2004.

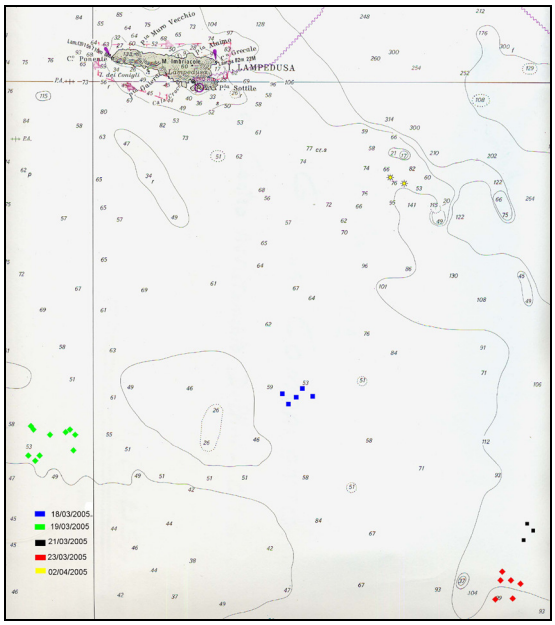

Fig. 7: Avvistamenti di** B. physalus **nel 2005.
Sl. 7: Opazovanja brazdastega kita v letu 2005.

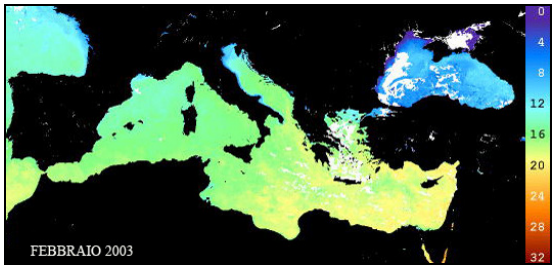

Fig. 4: Media delle temperature superficiali mediterranee nel febbraio 2003 (NOAA Satellite Information Service).
Sl. 4: Povprečna površinska temperatura Sredozemskega morja v februarju 2003 (NOAA Satellite Information Service).

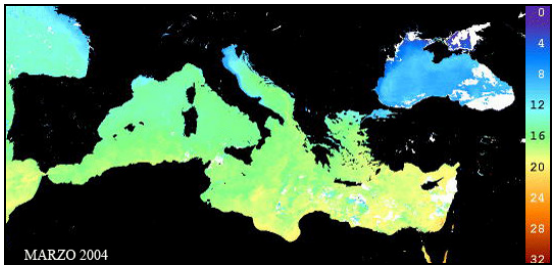

Fig. 6: Media delle temperature superficiali mediterranee nel marzo 2004 (NOAA Satellite Information Service).
Sl. 6: Povprečna površinska temperatura Sredozemskega morja v marcu 2004 (NOAA Satellite Information Service).

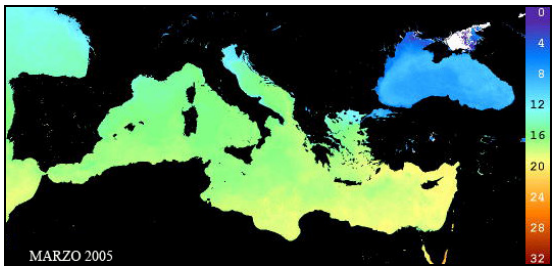

Fig. 8: Media delle temperature superficiali mediterranee nel marzo 2005 (NOAA Satellite Information Service).
Sl. 8: Povprečna površinska temperatura Sredozemskega morja v marcu 2005 (NOAA Satellite Information Service).

CONCLUSIONI

La presenza della balenottera comune nelle acque che circondano Lampedusa, in particolare in vicinanza della costa, è da ritenersi stagionale. Dai dati raccolti negli anni sia in mare sia attraverso notizie acquisite intervistando i pescatori ed il personale delle motovedette di Capitaneria di Porto e Guardia di Finanza (che per normale attività di controllo pattugliano giornalmente l'area) emerge come la specie in oggetto sia presente quasi esclusivamente nei mesi primaverili. Già dalle sole interviste era emerso che la presenza di *B. physalus* nell'area era soggetta a fluttuazioni legate alle variazioni annuali delle temperature che corrispondono ad una variazione della produzione primaria.

Osservando le cartine con gli avvistamenti e sovrapponendo queste alle mappe di temperatura si nota tale relazione. In particolare, osservando l'anno 2005, è molto evidente la bassa temperatura delle acque nell'area del Canale di Sicilia a cui corrispondono, al contrario degli anni precedenti, avvistamenti di *B. physalus* in aree molto distanti dalla costa lampedusana, ad ulteriore conferma che la temperatura delle acque condiziona notevolmente il passaggio di questo grande misticete (Celona & Comparetto, 2005).

Fig. 9: *B. physalus* ***durante l'alimentazione. (Foto: A. Celona)***
Sl. 9: Brazdasti kit med hranjenjem. (Foto: A. Celona)

E' l'attività trofica il motivo grazie al quale nell'Arcipelago delle Pelagie ogni anno è possibile osservare in prossimità delle coste diversi gruppi di balenottera (Fig. 9). Tale risultato emerge dalle osservazioni effettuate dagli autori e dalle dichiarazioni rilasciate dai pescatori, in particolare quelli impegnati nella pesca col cianciolo a piccoli pelagici, che ogni anno nei mesi primaverili s'imbattono nelle balenottere che si cibano in superficie nelle loro stesse aree di pesca. Gli eufasiacei infatti rappresentano una primaria fonte di cibo non solo per i grandi misticeti ma anche per i piccoli pesci pelagici, in particolare sgombri *(Scomber japonicus* e *S. scombrus),* acciughe *(Engraulis encrasicolus),* sardine *(Clupea pilchardus)* ed alaccie *(Sardinella aurita)* che in quel periodo rappresentano le specie bersaglio del cianciolo e che si accumulano sotto gli sciami entrando a far parte della dieta di diverse specie di predatori tra cui i misticeti (Celona & Comparetto, 2005).

La balenottera comune appare in bibliografia come un cetaceo dalle abitudini tipicamente pelagiche presente in aree con profondità che in media si aggirano intorno ai 2000 m (Notarbartolo di Sciara & Demma, 2004). Considerando le profondità attorno l'arcipelago delle Pelagie, in particolare nell'area a sud di Lampedusa (la nostra zona di ricerca) appare evidente che le acque non raggiungono valori così elevati ma al contrario la tipologia dei fondali è caratterizzata da batimetrie che raramente superano i 200 m. Pare che la scelta dell'habitat non avvenga in funzione della profondità ma sia legata all'alimentazione. Tali osservazioni trovano conferma nei lavori di alcuni autori che hanno evidenziato come tale scelta non sia legata alla profondità del fondale ma alla densità raggiunta dalle principali specie preda e dalle conseguenti condizioni fisiche che ne determinano l'accumulo (Cardinali *et al.*, 2005).

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POJAVLJANJE BRAZDASTEGA KITA *BALAENOPTERA PHYSALUS* (LINNAEUS, 1758) V AKVATORIJU LAMPEDUZE (OTOČJE PELAGIE) V POVEZAVI S POVRŠINSKO TEMPERATURO VODE

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POVZETEK

V članku so predstavljeni podatki o pojavljanju brazdastega kita v vodah pri otoku Lampeduza, zbrani med leti 2002 in 2005, ter povezava pojavljanja te vrste z batimetričnimi značilnostmi in temperaturo površinskih vod. Analiza je pokazala, da je pojavljanje brazdastega kita v nekaterih predelih obravnavanega območja v povezavi s površinsko temperaturo vode. Potrjena je tudi domneva, da se vrsta prehranjuje v vodah na južni strani otoka.

Ključne besede: *Balaenoptera physalus*, temperatura, trofičnost, Lampeduza, Sredozemlje

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IZVLEČEK

Po standardni srednjeevropski fitocenološki metodi smo v letih 2001 in 2005 preučili nekatere zanimive gozdne sestoje na Krasu (jugozahodna Slovenija). Bukov sestoj v kotanji Draga pri vasi Ponikve smo uvrstili v asociacijo Ornithogalo pyrenaici-Fagetum. *Pionirski sestoji plemenitih listavcev pri vasi Sveto in pod Železnimi vrati (pod Trsteljem, severovzhodno od vasi Lipa) so nastali na rastiščih, ki jih je med prvo svetovno vojno očitno preoblikoval človek. Zaradi številnih nitrofilnih vrst, indikatorjev antropogenih vplivov, te drugotne sestoje uvrščamo v novo asociacijo z začasnim imenom* Veronico sublobatae-Fraxinetum excelsioris *nom. prov. V botanično že precej raziskanih Škocjanskih jamah in njihovi okolici smo ugotovili tudi fragmente sestojev asociacij* Corydalido-Ostryetum, Saxifrago petraeae-Tilietum platyphylli *in* Veratro nigri-Fraxinetum.

Ključne besede: fitocenologija, sinsistematika, plemeniti listavci, *Aremonio-Fagion*, *Erythronio-Carpinion, Ostryo-Tilienion*, Škocjanske jame, Slovenija

CONTRIBUTO ALLA CONOSCENZA DELLA VEGETAZIONE BOSCHIVA DEL CARSO (SLOVENIA SUD-OCCIDENTALE)

SINTESI

Seguendo il metodo fitocenologico centroeuropeo standard, l'autore ha studiato alcune interessanti aree boschive sul Carso (Slovenia sud-occidentale) negli anni 2001 e 2005. Il faggeto nella valle di Draga in prossimità del villaggio di Ponikve è stato inserito nell'associazione Ornithogalo pyrenaici-Fagetum. *I boschi pionieri formati da alberi a foglia caduca nobili vicino al villaggio di Sveto e ai piedi della località di Železna vrata (a nord-est del villaggio di Lipa) si sono sviluppati su terreni rimodellati dall'uomo durante la prima guerra mondiale. Vista la presenza di numerose specie nitrofile, indicatori di influssi antropici, tali boschi vengono inseriti in una nuova associazione provvisoriamente chiamata* Veronico sublobatae-Fraxinetum excelsioris *nom. prov. Nelle Grotte di San Canziano, ricercate bene dal punto di vista botanico, e nei dintorni l'autore riporta la presenza di frammenti boschivi appartenenti alle associazioni* Corydalido-Ostryetum, Saxifrago petraeae-Tilietum platyphylli *e* Veratro nigri-Fraxinetum.

Parole chiave: fitocenologia, sinsistematica, alberi a foglia caduca nobili, *Aremonio-Fagion*, *Erythronio-Carpinion, Ostryo-Tilienion*, Grotte di San Canziano, Slovenia

V spomin slovenskemu fitocenologu dr. Milanu Piskerniku (1925–2006)

UVOD

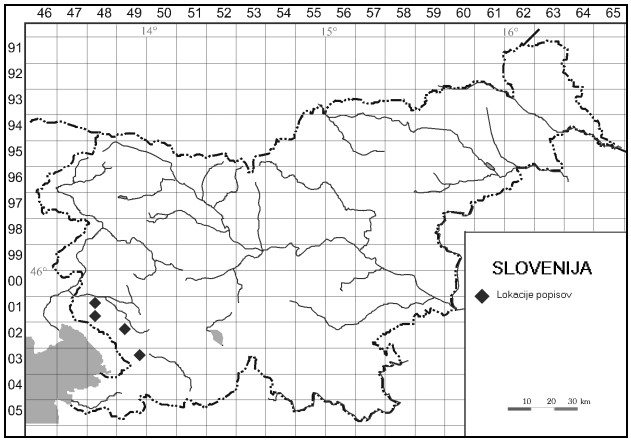
Gozdno rastje Krasa je dobro raziskano in temeljito dokumentirano s številnimi objavami. Med mnogimi avtorji, ki so preučevali tukajšnjo gozdno vegetacijo, naj naštejemo le nekatere: M. Wraber (npr. 1954, 1957, 1963, 1967), Poldini (1972, 1982, 1985, 1989 in druge objave), Piskernik (1965, 1985, 1991, 2000 in druge objave), Zupančič (npr. 1997, 1999a, b), Zupančič & Žagar (2002) idr. Zbirne podatke o Krasu in njegovi pokrajini najdemo v obsežnih strokovnih monografijah (npr. Kranjc, 1997, 1999; Gams, 2003; Mihevc, 2005), zanimive podatke tudi v bolj poljudno napisanih delih (npr. Gogala, 2003). Raziskave o pestrosti in rodovitnosti gozdnih rastišč so naredili gozdarji (npr. Urbančič *et al.*, 1999), o nekdanji podobi kraškega gozda pa so pisali palinologi (Culiberg, 1995, 1999, 2005; Šercelj, 1996).

MATERIAL IN METODE

V letih 2001 in 2005 smo pri naših terenskih ogledih po standardni srednjeevropski metodi (Brun-Blanquet, 1964) na Krasu popisali nekaj zanimivih gozdnih sestojev (Sl. 1), zbrane popise vnesli v bazo podatkov FloVegSi (Seliškar *et al.*, 2003) in jih med seboj primerjali z metodama hierarhične klasifikacije in z ordinacijsko metodo glavnih koordinat (PCoA). Uporabljali smo programski paket SYN-TAX 2000 (Podani, 2001) in kot mero različnosti komplement koeficienta "similarity ratio". Kombinirane ocene zastiranja in pogostnosti smo pretvorili z vrstilno pretvorbo, ki jo je predlagal van der Maarel (1979). Rezultate numeričnih metod smo kombinirali s klasično ureditvijo na podlagi diagnostičnih vrst. Okoljske razmere (geološka podlaga, tla, podnebje) na Krasu povzemamo po že omenjenih monografijah (Kranjc, 1999; Mihevc, 2005), viri za podnebne podatke so tudi Ogrin (1996), B. Zupančič (1995) in Mekinda-Majaron (1995), za podatke o geološki zgradbi pa Buser (1973a, b) in Jurkovšek *et al.* (1996).

Raziskovano območje ima zaledno submediteransko podnebje, s povprečno letno temperaturo 11–12 °C, s povprečno temperaturo najhladnejšega meseca okoli 2 °C in povprečno temperaturo najtoplejšega meseca med 20 in 21 °C. Povprečna letna količina padavin je med 1300 mm in 1600 mm.

Nomenklaturni in taksonomski vir za praprotnice in semenke je Mala flora Slovenije (Martinčič *et al.*, 1999), razen taksona *Helleborus odorus* Waldst. & Kit. ex Willd var. *istriacus* Schiffn. Nomenklaturni in taksonomski viri za mahove so Frahm & Frey (1992) ter Martinčič (2003), za lišaje pa Wirth (1995). Pri imenih in sintaksonomiji združb v glavnem sledimo avtorjem Robič & Accetto (2001) in Aeschimann *et al.* (2004c), popoln seznam z njihovimi avtorji pa je v dodatku.



Sl. 1: Raziskovano območje z lokacijami popisanih gozdnih sestojev na zemljevidu Slovenije.
Fig. 1: Researched area with the localities of the recorded forest stands on the map of Slovenia.

REZULTATI IN RAZPRAVA

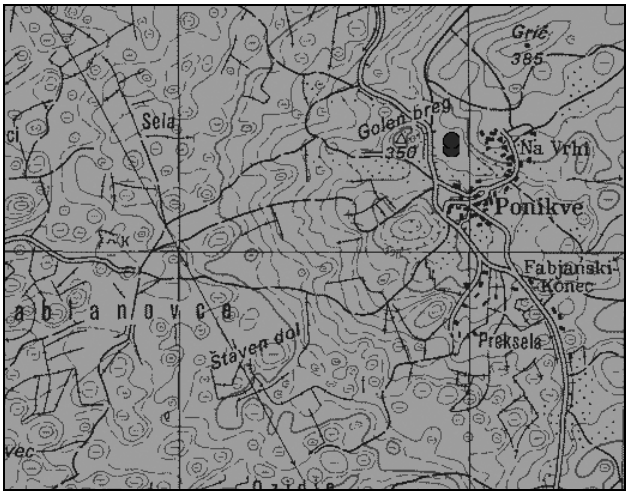
Bukov gozd v kotanji Draga pri Ponikvah

Pri vasi Ponikve je globoka kotanja Draga (Sl. 2), po kateri v deževju odteka voda v 120 m globoko in 400 m dolgo vodno jamo (Trošt, 1968). Strma pobočja kotanje so porasla z bukovim gozdom (Culiberg, 1999). Geološka podlaga je kredni ploščasti in laminirani apnenec z roženci, t. i. komenski apnenec (Jurkovšek *et al.*, 1996), tla pa so, zaradi primesi rožence, nekoliko zakisana. To je jerovica, zaradi roženčevega skeleta najbrž njen podtip kremenica *(Dystric Cambisols)* (Urbančič *et al.*, 2005). Naredili smo dva popisa (Tab. 1), enega na osojni in drugega na prisojni strani kotanje. Po floristični sestavi lahko bukov gozd v Dragi uvrstimo v asociacijo *Ornithogalo pyrenaici-Fagetum* Marinček, Papež, Dakskobler & Zupančič 1990, najbrž v njeno toploljubnejšo subasociacijo, *-fraxinetosum orni* Dakskobler 1996, ki smo jo popisali predvsem v flišnih Goriških Brdih (Dakskobler, 1996a). V fitogeografskem smislu gozd bukve in pirenejskega ptičjega mleka v Dragi pri Ponikvah vrednotimo kot novo geografsko varianto *Ornithogalo-Fagetum* var. geogr. *Helleborus istriacus* var. geogr. nova *(holotypus* je popis 2 v Tabeli 1). V to geografsko varianto (takrat označeno kot nom. prov.) smo že pred leti uvrstili tudi podobne submontanske bukove sestoje v Koprskem gričevju (Dakskobler, 1996b). Takson *Helleborus odorus* var. *istriacus* zaradi zelo ozkega areala, ki obsega jugozahodno Slovenijo, Kras, Istro, Kvarnerske otoke in Velebit (Lacza, 1958) fitogeografsko dobro razlikuje submediteranske bukove gozdne združbe jugozahodne Slovenije od podobnih združb v Posočju (Dakskobler, 1996b, 1997).

Tab. 1: Submontanski bukov gozd pri Ponikvah na Krasu.
Tab. 1: Submontane beech forest near the village of Ponikve in Kras.

	Številka popisa (Number of relevé)		**1**	**2**		
	Nadmorska višina v m (Altitude in m)		330	330		
	Lega (Aspect)		NNE	S		
	Nagib v stopinjah (Slope in degrees)		40	30		
	Matična podlaga (Parent material)		A, R	A, R		
	Tla (Soil)		DC	DC		
	Kamnitost v % (Stoniness in %)		10	5		
	Zastiranje v % (Cover in %):					
	Zgornja drevesna plast (Upper tree layer)	E3b	80	80		
	Spodnja drevesna plast (Lower tree layer)	E3a	.	5		
	Grmovna plast (Shrub layer)	E2	30	20		
	Zeliščna plast (Herb layer)	E1	70	80		
	Mahovna plast (Moss layer)	E0	10	5		
	Največji prsni premer (Maximum diameter)	cm	25	28		
	Največja drevesna višina (Maximum height)	m	60	90		
	Velikost popisne ploskve (Relevé area)	m2	100	200		
	Število vrst (Number of species)		30	39		
	Razlikovalnice asociacije (Differential sp. of ass.)					Pr.
QP	*Lathyrus venetus*	E1	.	+		1
QP	*Sesleria autumnalis*	E1	.	r		1
QF	*Ornithogalum pyrenaicum*	E1	.	+		1
	Razlikovalnice subasociacije (Diff. sp. of subass.)					
QRF	*Castanea sativa*	E3b	+	+		2
QP	*Fraxinus ornus*	E3b	.	+		1
	Geografska razlikovalna vrsta (Geograph. diff. sp.)					
QP	*Helleborus odorus* var. *istriacus*	E1	.	+		1
AF	***Aremonio-Fagion***					
	Lamium orvala	E1	2	2		2
	Aposeris foetida	E1	+	+		2
	Hacquetia epipactis	E1	.	+		1
F	***Fagetalia sylvaticae***					
	Fagus sylvatica	E3b	4	3		2
	Fagus sylvatica	E3a	.	+		1
	Fagus sylvatica	E2b	+	1		2
	Fagus sylvatica	E2a	+	.		1
	Fagus sylvatica	E1	.	+		1
	Carpinus betulus	E3b	1	3		2
	Carpinus betulus	E3a	+	.		1
	Carpinus betulus	E2b	+	.		1
	Acer pseudoplatanus	E3b	+	1		2
	Acer pseudoplatanus	E3a	+	.		1
	Acer pseudoplatanus	E2b	1	.		1
	Acer pseudoplatanus	E2a	1	+		2
	Acer pseudoplatanus	E1	1	1		2
	Corydalis cava	E1	2	3		2
	Cardamine bulbifera	E1	2	2		2
	Lilium martagon	E1	1	1		2
	Polygonatum multiflorum	E1	1	1		2
	Sambucus nigra	E2b	+	1		2
	Sambucus nigra	E2a	1	1		2
	Aruncus dioicus	E1	+	1		2
	Heracleum sphondylium	E1	+	+		2
	Phyllitis scolopendrium	E1	+	.		1
	Tilia cordata	E1	+	.		1
	Athyrium filix-femina	E1	+	.		1
	Dryopteris filix-mas	E1	+	.		1
	Carex sylvatica	E1	.	+		1
	Galium laevigatum	E1	.	+		1
	Symphytum tuberosum	E1	.	+		1

	Številka popisa (Number of relevé)		1	2		
QP	***Quercetalia pubescentis***					
	Convallaria majalis	E1	+	+		2
	Quercus cerris	E1	.	+		1
QF	***Querco-Fagetea***					
	Anemone nemorosa	E1	3	3		2
	Hedera helix	E3a	1	1		2
	Hedera helix	E1	1	1		2
	Corylus avellana	E2b	+	1		2
	Corylus avellana	E2a	.	1		1
	Ranunculus ficaria	E1	+	1		2
	Acer campestre	E2a	.	+		1
	Acer campestre	E2b	.	+		1
	Carex digitata	E1	.	+		1
	Malus sylvestris	E2a	.	+		1
	Primula vulgaris	E1	.	+		1
	Quercus petraea	E3b	.	+		1
VP	***Vaccinio-Piceetea***					
	Picea abies	E3b	.	+		1
	Picea abies	E2b	.	1		1
	Picea abies	E2a	+	.		1
	Calamagrostis arundinacea	E1	.	+		1
	Luzula luzuloides	E1	.	+		1
	Dryopteris carthusiana	E1	+	.		1
AT	***Asplenietea trichomanis***					
	Polypodium vulgare	E1	+	+		2
	Polypodium interjectum	E1	+	.		1
O	**Druge vrste (Other species)**					
	Robinia pseudacacia	E3b	+	.		1
	Colchicum autumnale	E1	.	+		1
M	**Mahovi in lišaji (Mosses and lichens)**					
	Atrichum undulatum	E0	1	+		2
	Plagiothecium sp.	E0	+	.		1
	Thamnobryum alopecurum	E0	+	.		1



Sl. 2: Nahajališče bukovega gozda pri Ponikvah. (Vir: Državna topografska karta RS 1: 25 000, GURS).
Fig. 2: Locality of beech forest near Ponikve. (Source: State topographical map 1: 25 000, GURS).

M. Piskernik *(in litt.)* bi po svoji raziskovalni metodi bukov gozd v Dragi vrednotil takole: popis št. 1 je podoben mikroreliefni združbi *Polypodietum interjecti* (v Piskernik, 2000), popis št. 2 pa je podoben mikroreliefni združbo *Colchicetum autumnalis* (v Piskernik, 2000).

Bukev je bila v preteklosti na Krasu precej bolj pogosta drevesna vrsta (to potrjujejo tudi ugotovitve palinologov, npr. Culiberg 1995, 1999) in njeno redkost v tukajšnji realni gozdni vegetaciji povezujemo predvsem s stoletja trajajočimi antropozoogenimi vplivi. V Dragi pri Ponikvah se je najbrž ohranila zaradi velike strmine pobočij, globokih tal (kremenica) in krajevno hladnejšega podnebja. Podobnih za ohranitev bukovih sestojev ustreznih nahajališč in rastišč je na Krasu najbrž več. A. Mihevc (osebno sporočilo) nas je tako opozoril na uspevanje bukve v kotanji Bukovnik pri Divači.

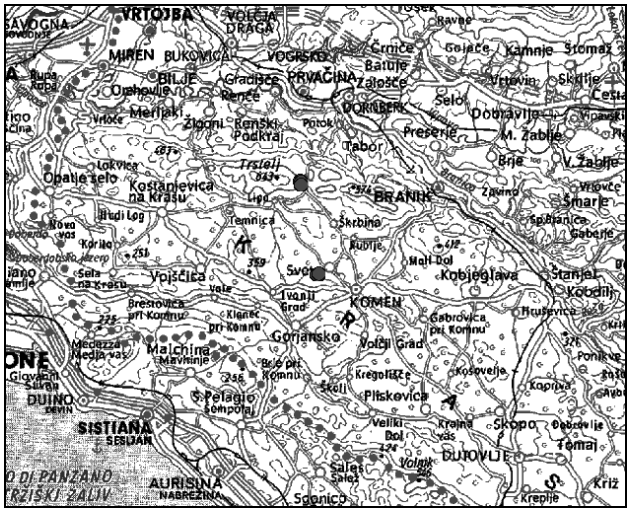
Pionirski gozdovi plemenitih listavcev pri vasi Sveto in pod Železnimi vrati

Severno od vasi Sveto v osrčju Komenske planote, le nekaj 100 m severozahodno od zaselka Samči, na površini okoli 4 ha bolj ali manj ravnega in ponekod precej kamnitega sveta uspeva mešan pionirski gozd, drogovnjak in mlajši debeljak plemenitih listavcev, velikega

jesena, ostrolistnega javorja, gorskega javorja in lipe. Gozd plemenitih listavcev, na obrobju katerega so posamezna starejša drevesa črnega bora, je razširjen levo, predvsem pa desno od nekdanje široke in utrjene vojaške poti (mulatjere) proti vasi Lipa – danes je to boljši kolovoz oz. slaba makadamska cesta (Sl. 3). Geološka podlaga je kredni ploščasti apnenec z roženci (t. i. komenski skladi) – Buser (1973b), tla so v glavnem rendzina. V tem pionirskem gozdu smo naredili štiri fitocenološke popise (popisi 1 do 4 v Tabeli 2). V sestavi njegove zeliščne plasti je obilo nitrofilnih vrst ruderalnih rastišč (najobilnejša med njimi je vrsta *Smyrnium perfoliatum)*. Pionirski gozd je domnevno nastal na antropogeno preoblikovanem rastišču. Do tega preoblikovanja je bržkone prišlo med prvo svetovno vojno. Takrat je bila vas Sveto, kot piše Močnik (2005), močno izkoriščana za vojaško uporabo 5. avstro-ogrske soške armade. V okolici vasi so bila različna skladišča, tabori in barakarska naselja za počitek vojakov in za rezervne enote.

Podobne pionirske sestoje smo opazili pod cesto Lipa–Dornberk in sicer v kotanji Jezero pod Železnimi vrati (severovzhodno pod Trsteljem). Tudi Lipa je bila med prvo svetovno vojno v neposrednem zaledju avstrijskih frontnih položajev. V kotanji Jezero je bil velik oskrbovalni center avstro-ogrske vojske (M. Močnik, *in litt.*). Na Železna vrata je bil iz Hublja pri Ajdovščini speljan tudi vodovod. Tu sta bila vodna črpalka in zbiralnik, vodovod se je nadaljeval za Komen in Gorjansko in drugi krak za Opatje Selo (Močnik, *ibid.*). Površina pionirskih sestojev plemenitih listavcev v nekoliko mraziščni kotanji (v primerjavi z okolico ima hladnejše krajevno podnebje) Jezero je podobna kot pri vasi Sveto, okoli 4 ha. Drevesna sestava je tu nekoliko drugačna – prevladujeta veliki jesen (večinoma mlajša drevesa, drogovnjak) in gorski javor (pogostejša starejša drevesa, debeljak), zelo redka je lipa. V zeliščni plasti je, podobno kot pri Svetem, precej vrst nitrofilnih in ruderalnih rastišč razredov *Artemisietea vulgaris* sensu Aeschimann *et al.* 2004c oz. *Galio-Urticetea* sensu L. Mucina 1993 in *Stellarietea mediae*, med njimi najbolj obilna kopriva *(Urtica dioica),* prav tako so pogoste vrste gojenih travnikov (iz razreda *Molinio-Arrhenatheretea*). Geološka podlaga je kredni oz. paleocenski apnenec (Buser, 1973b), tla na uravnavi so globoka, rjava. Vidni so sledovi preoblikovanja površja, ostanki zidov ipd. Naredili smo en popis na komaj nagnjenem pobočju na obodu kotanje in dva popisa v ravnem dnu. Vseh sedem popisov smo združili v tabelo (Tab. 2) in po pričakovanju so se popisi, ki smo jih naredili pri Svetem, združevali ločeno od popisov, ki smo jih naredili pri Železnih vratih. Sinsistematsko vrednotenje teh drugotnih, pionirskih sestojev je težavno. O potencialno naravni vegetaciji na teh rastiščih lahko sklepamo le posredno. Obstoječa vrstna sestava (uspevanje in pogostnost nekaterih diagnostičnih vrst zveze *Erythronio-Carpinion*, uspevanje submediteranskih vrst reda *Quercetalia pubescentis* in pogostnost vrst razreda *Querco-Fagetea)* kaže na potencialna rastišča submediteranskega gozda belega gabra *(Ornithogalo pyrenaici-Carpinetum ostryetosum* ali *Asaro-Carpinetum betuli)*. Diagnostične za združbe plemenitih listavcev (zveza *Tilio-Acerion* s. lat. oz. *Fraxino-Acerion* Fukarek 1969 sensu P. Košir 2004) so le dominantne drevesne vrste: *Fraxinus excelsior*, *Tilia platyphyllos*, *Acer pseudoplatanus*, *A. platanoides*, v zeliščni plasti takih vrst skoraj ni (izjema sta morda vrsti *Lamium orvala* in *Geranium robertianum* na posameznih popisih).

Preučeni sestoji so torej po nastanku in floristični sestavi precej drugačni od doslej znanih združb plemenitih listavcev v Sloveniji in njeni soseščini (Košir, 2004), tudi od nekaterih združb, opisanih v submediteranskem območju (npr. Accetto, 1991; Dakskobler, 1999; Košir & Surina, 2005). Nekoliko so podobni drugotni združbi velikega jesena in pirenejskega ptičjega mleka *(Ornithogalo pyrenaici-Fraxinetum excelsioris* Čušin & Dakskobler 2006 nom. prov.), ki uspeva v Posočju na nekdanjih kmetijskih površinah na flišu, na potencialnih rastiščih podgorskega bukovega gozda, največ skupnih vrst pa imajo s sestoji asociacije *Paeonio officinalis-Tilietum platyphylli*, ki sta jo Košir & Surina (2005) opisala v montanskem pasu v slovenskem delu Čičarije. Med razlikovalnicami te asociacije so namreč tudi vrste *Aristolochia lutea*, *Ornithogalum umbellatum* in *Smyrnium perfoliatum*. Vse tri, zadnji dve pogosto, uspevajo tudi v naših sestojih. V njih smo na enem popisu našli tudi



Sl. 3: Nahajališča pionirskih sestojev plemenitih listavcev *(Veronico sublobatae-Fraxinetum excelsioris* ***nom. prov.) na Krasu. (Vir: Pregledna karta Slovenije 1:250000, GURS)***

Fig. 3: Localities of pioneer stands of noble deciduous trees *(Veronico sublobatae-Fraxinetum excelsioris* ***nom. prov.) in Kras. (Source: Map of Slovenia, 1:250000, GURS)***

Tab. 2: Pionirski sestoji plemenitih listavcev na Krasu *(Veronico sublobatae-Fraxinetum excelsioris* ***nom. prov.).***
Tab. 2: Pioneer stands of noble deciduous trees in Kras *(Veronico sublobatae-Fraxinetum excelsioris* ***nom. prov.).***

	Številka popisa (Number of relevé)		**1**	**2**	**3**	**4**	**5**	**6**	**7**		
	Nadmorska višina v m (Altitude in m)		310	310	310	315	415	415	415		
	Lega (Aspect)		NNW	NW	0	NE	S	0	0		
	Nagib v stopinjah (Slope in degrees)		2	5	0	5	2	0	0		
	Matična podlaga (Parent material)		A	A	A	A	A	A	A		
	Tla (Soil)		R	R	R	R	R	Rj	Rj		
	Kamnitost v % (Stoniness in %)		10	20	20	10	5	5	0		
	Zastiranje v % (Cover in %):										
	Zgornja drevesna plast (Upper tree layer)	E3b	90	80	90	80	90	80	80		
	Spodnja drevesna plast (Lower tree layer)	E3a	10	10	10	20	5	.	20		
	Grmovna plast (Shrub layer)	E2	20	20	10	60	20	50	20		
	Zeliščna plast (Herb layer)	E1	80	80	90	80	90	80	80		
	Mahovna plast (Moss layer)	E0	10	10	10	10	5	5	5		
	Največji prsni premer (Maximum diameter)	cm	30	35	40	80	40	60	50		
	Največja drevesna višina (Maximum height)	m	20	22	22	30	24	32	25		
	Velikost popisne ploskve (Relevé area)	m2	400	400	400	400	400	400	400		
	Število vrst (Number of species)		47	47	39	45	62	41	36		
	Razlikovalnice asociacije (Diff. species of the association)									Pr.	Fr.
TA	*Fraxinus excelsior*	E3b	4	2	2	3	4	+	2	7	100
TA	*Fraxinus excelsior*	E3a	+	.	+	+	1	.	+	5	71
TA	*Fraxinus excelsior*	E2b	+	+	+	3	2	3	1	7	100
TA	*Fraxinus excelsior*	E2a	+	2	+	2	1	2	1	7	100
TA	*Fraxinus excelsior*	E1	.	1	.	1	2	1	1	5	71
MA	*Ornithogalum umbellatum*	E1	+	1	1	.	+	+	+	6	86
GU	*Veronica sublobata* (*V. hederifolia* subsp. *lucorum*)	E1	.	+	+	+	.	1	1	5	71
	Razlikovalnice nižjih enot (Diff. sp. of lower units)										
GU	*Smyrnium perfoliatum*	E1	4	4	4	4	.	.	.	4	57
GU	*Urtica dioica*	E1	.	.	.	.	1	2	1	3	43
GU	*Glechoma hederacea*	E1	.	.	.	.	1	1	1	3	43
QF	*Cerastium sylvaticum*	E1	.	.	.	.	2	2	1	3	43
F	*Asarum europaeum* subsp. *caucasicum*	E1	.	.	.	.	1	1	+	3	43
EC	***Erythronio-Carpinion***										
	Crocus vernus subsp. *vernus*	E1	+	1	1	+	+	2	2	7	100
	Lonicera caprifolium	E2a	1	1	1	1	1	.	.	5	71
	Ornithogalum pyrenaicum	E1	+	+	.	+	+	.	.	4	57
	Primula vulgaris	E1	+	.	.	.	1	+	1	4	57
	Galanthus nivalis	E1	.	.	.	.	.	+	.	1	14
AF	***Aremonio-Fagion***										
	Lamium orvala	E1	.	.	2	.	.	.	+	2	29
	Aposeris foetida	E1	.	.	.	.	.	r	.	1	14
TA	***Tilio-Acerion* (*Fraxino-Acerion* sensu P. Košir)**										
	Acer pseudoplatanus	E3b	+	1	1	3	1	5	4	7	100
	Acer pseudoplatanus	E3a	.	+	+	+	1	.	+	5	71
	Acer pseudoplatanus	E2b	.	+	+	.	+	.	.	3	43
	Acer pseudoplatanus	E2a	+	+	.	+	.	+	.	4	57
	Acer pseudoplatanus	E1	1	1	1	1	1	1	2	7	100
	Tilia platyphyllos	E3b	1	+	+	2	.	r	.	5	71
	Tilia platyphyllos	E3a	+	+	.	+	.	.	.	3	43
	Tilia platyphyllos	E2b	+	+	.	+	.	.	.	3	43
	Tilia platyphyllos	E2a	.	.	.	+	.	.	.	1	14
	Tilia platyphyllos	E1	.	+	.	1	.	.	.	2	29
	Acer platanoides	E3b	3	4	4	+	.	.	.	4	57
	Acer platanoides	E3a	.	.	+	+	.	.	.	2	29
	Acer platanoides	E2b	.	+	.	.	.	.	.	1	14
	Acer platanoides	E2a	+	.	.	.	.	.	.	1	14
	Acer platanoides	E1	1	1	1	+	.	.	.	4	57
	Geranium robertianum	E1	.	.	.	+	1	.	.	2	29

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7		
F	***Fagetalia sylvaticae***										
	Brachypodium sylvaticum	E1	+	+	.	+	1	+	+	6	86
	Polygonatum multiflorum	E1	1	1	1	1	.	.	.	4	57
	Sambucus nigra	E3a	.	.	.	.	.	.	1	1	14
	Sambucus nigra	E2b	.	.	+	1	1	1	.	4	57
	Sambucus nigra	E2a	+	+	.	.	.	+	+	4	57
	Sambucus nigra	E1	.	.	.	.	+	.	.	1	14
	Carex sylvatica	E1	+	+	.	.	.	+	.	3	43
	Corydalis cava	E1	.	+	.	+	.	.	.	2	29
	Heracleum sphondylium	E1	.	+	.	+	.	.	.	2	29
	Viola reichenbachiana	E1	.	.	+	.	+	.	.	2	29
	Prunus avium	E2a	+	.	.	.	.	.	.	1	14
	Carpinus betulus	E2a	.	+	.	.	.	.	.	1	14
	Galeobdolon montanum	E1	.	.	.	.	+	.	.	1	14
	Mycelis muralis	E1	.	.	.	.	+	.	.	1	14
	Salvia glutinosa	E1	.	.	.	.	+	.	.	1	14
	Sanicula europaea	E1	.	.	.	.	+	.	.	1	14
	Senecio nemorensis agg.	E1	.	.	.	.	+	.	.	1	14
	Euphorbia dulcis	E1	.	.	.	.	.	.	+	1	14
QP	***Quercetalia pubescentis***										
	Fraxinus ornus	E3a	+	+	+	+	.	.	.	4	57
	Fraxinus ornus	E2b	+	.	+	.	.	.	.	2	29
	Fraxinus ornus	E2a	.	+	.	.	+	.	.	2	29
	Valeriana collina	E1	+	.	+	+	.	.	.	3	43
	Asparagus tenuifolius	E1	.	.	+	.	+	+	.	3	43
	Ruscus aculeatus	E1	.	.	.	.	1	+	+	3	43
	Ostrya carpinifolia	E3b	.	+	.	+	.	.	.	2	29
	Ostrya carpinifolia	E3a	.	.	.	+	.	.	.	1	14
	Sesleria autumnalis	E1	+	+	.	.	.	.	.	2	29
	Cornus mas	E2b	.	.	.	.	+	+	.	2	29
	Convallaria majalis	E1	.	.	.	.	+	+	.	2	29
	Vicia grandiflora	E1	.	+	.	.	.	.	.	1	14
	Quercus pubescens	E3b	.	.	.	r	.	.	.	1	14
	Aristolochia lutea	E1	.	.	.	.	1	.	.	1	14
	Campanula rapunculoides	E1	.	.	.	.	+	.	.	1	14
	Clematis recta	E1	.	.	.	.	+	.	.	1	14
	Orchis mascula s. lat.	E1	.	.	.	.	+	.	.	1	14
	Orchis purpurea	E1	.	.	.	.	r	.	.	1	14
	Paeonia mascula	E1	.	.	.	.	.	r	.	1	14
QF	***Querco-Fagetea***										
	Hedera helix	E3a	2	1	1	.	+	.	.	4	57
	Hedera helix	E1	1	1	1	2	.	+	.	5	71
	Acer campestre	E3a	.	+	+	.	.	.	+	3	43
	Acer campestre	E2b	+	+	+	.	.	.	.	3	43
	Acer campestre	E2a	+	.	.	.	.	+	.	2	29
	Acer campestre	E1	+	.	.	+	.	.	.	2	29
	Corylus avellana	E2b	.	.	.	r	+	+	+	4	57
	Listera ovata	E1	.	.	+	.	1	+	+	4	57
	Moehringia trinervia	E1	+	.	.	.	+	.	+	3	43
	Ulmus minor	E3a	.	+	.	.	.	.	+	2	29
	Ulmus minor	E2b	.	.	.	.	+	.	.	1	14
	Ulmus minor	E2a	+	+	.	.	.	.	+	3	43
	Ulmus minor	E1	.	.	.	+	+	.	.	2	29
	Cruciata glabra	E1	.	.	.	r	1	.	.	2	29
	Ranunculus ficaria	E1	.	.	.	+	+	.	.	2	29
	Stachys sylvatica	E1	.	.	.	.	1	1	.	2	29
	Ranunculus auricomus agg.	E1	.	.	.	.	.	2	2	2	29
	Festuca heterophylla	E1	+	.	.	.	.	.	.	1	14
	Quercus petraea	E3b	r	.	.	.	.	.	.	1	14
	Hepatica nobilis	E1	.	.	.	.	1	.	.	1	14
	Anemone nemorosa	E1	.	.	.	.	.	+	.	1	14

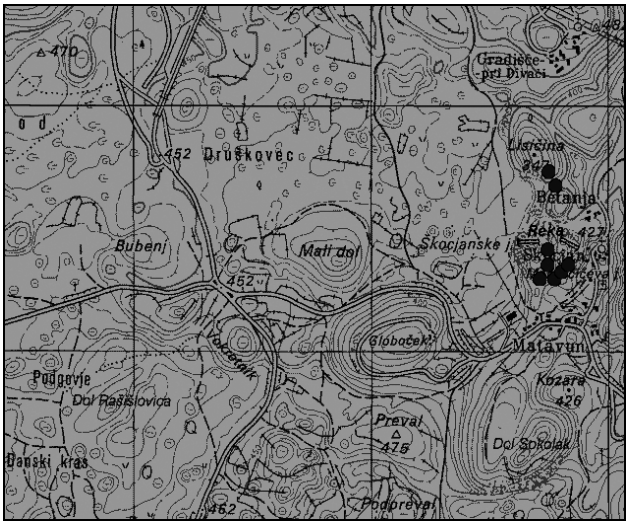
	Številka popisa (Number of relevé)		1	2	3	4	5	6	7		
RP	***Rhamno-Prunetea***										
	Crataegus monogyna	E2b	+	+	+	+	+	.	+	6	86
	Crataegus monogyna	E2a	+	.	+	+	+	+	+	6	86
	Crataegus monogyna	E1	.	+	.	.	.	.	.	1	14
	Euonymus europaea	E2a	.	.	1	.	.	.	.	1	14
	Euonymus europaea	E1	1	1	.	1	.	.	.	3	43
	Ligustrum vulgare	E2a	+	+	.	.	+	.	.	3	43
	Rosa canina agg.	E2a	.	.	+	.	+	.	.	2	29
	Prunus spinosa	E2a	.	.	+	.	.	.	.	1	14
	Prunus spinosa	E1	.	.	.	+	.	.	.	1	14
	Cornus sanguinea	E2a	+	.	.	.	.	.	.	1	14
	Rubus fruticosus agg.	E2a	.	.	.	.	+	.	.	1	14
EP	***Erico-Pinetea***										
	Carex alba	E1	.	+	.	+	.	.	.	2	29
	Pinus nigra	E3b	.	.	r	+	.	.	.	2	29
TG	***Trifolio-Geranietea***										
	Viola hirta	E1	+	+	+	.	.	.	.	3	43
	Lilium bulbiferum	E1	.	.	.	+	+	.	.	2	29
	Arctium nemorosum	E1	.	.	.	.	.	+	+	2	29
	Polygonatum odoratum	E1	.	.	.	+	.	.	.	1	14
	Pulmonaria australis	E1	.	.	.	.	+	.	.	1	14
FB	***Festuco-Brometea***										
	Ranunculus bulbosus	E1	r	.	.	.	.	.	.	1	14
PT	***Polygono-Trisetalia***										
	Crocus vernus subsp. *albiflorus*	E1	.	.	.	.	1	.	.	1	14
MA	***Molinio-Arrhenatheretea***										
	Colchicum autumnale	E1	+	+	.	1	+	+	1	6	86
	Poa trivialis	E1	+	+	+	.	1	+	1	6	86
	Veronica chamaedrys	E1	+	+	.	+	+	+	.	5	71
	Anthriscus sylvestris	E1	.	.	.	.	+	+	1	3	43
	Taraxacum officinale	E1	.	+	.	.	.	.	.	1	14
	Ajuga reptans	E1	.	.	.	.	+	.	.	1	14
GU	***Galio-Urticetea***										
	Alliaria petiolata	E1	+	+	2	1	2	.	1	6	86
	Geum urbanum	E1	1	1	1	1	1	1	.	6	86
	Lamium maculatum	E1	+	+	+	.	2	3	3	6	86
	Allium scorodoprasum	E1	1	+	+	1	1	.	.	5	71
	Galium aparine	E1	.	+	+	.	1	2	1	5	71
	Viola odorata	E1	+	+	+	.	.	.	.	3	43
	Calystegia sepium	E1	.	.	.	.	.	.	+	1	14
	Parietaria officinalis	E1	.	.	.	.	.	.	+	1	14
SM	***Stellarietea mediae***										
	Stellaria media	E1	.	.	+	.	+	.	+	3	43
	Aethusa cynapium	E1	.	.	.	.	+	+	1	3	43
	Geranium purpureum	E1	+	.	.	.	.	.	.	1	14
O	**Druge vrste (Other species)**										
	Allium schoenoprasum subsp. *schoenoprasum* ?	E1	.	+	.	+	+	+	+	5	71
	Robinia pseudacacia	E3b	.	.	+	.	+	+	2	4	57
	Robinia pseudacacia	E3a	.	.	+	+	.	.	.	2	29
	Robinia pseudacacia	E2a	.	.	+	.	.	+	.	2	29
	Fragaria vesca	E1	+	+	.	.	+	.	.	3	43
	Lunaria annua	E1	.	.	+	.	.	.	.	1	14
	Prunus domestica	E2b	.	.	+	.	.	.	.	1	14
	Hemerocallis fulva	E1	.	.	.	+	.	.	.	1	14
	Abies alba	E2b	.	.	.	r	.	.	.	1	14
	Aesculus hippocastanum	E3b	.	.	.	.	.	+	.	1	14
	Aesculus hippocastanum	E3a	.	.	.	.	.	.	+	1	14
	Aesculus hippocastanum	E2b	.	.	.	.	.	.	+	1	14

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7		
ML	**Mahovi in lišaji (Mosses and lichens)**										
	Schistidium apocarpum	E0	1	1	+	+	.	.	.	4	57
	Anomodon attenuatus	E0	+	+	+	.	.	.	.	3	43
	Anomodon viticulosus	E0	+	+	.	1	.	.	.	3	43
	Isothecium alopecuroides	E0	+	1	.	1	.	.	.	3	43
	Ctenidium molluscum	E0	+	.	.	+	.	.	.	2	29
	Homalothecium sericeum	E0	+	.	+	.	.	.	.	2	29
	Mnium sp.	E0	+	.	.	.	+	.	.	2	29
	Brachythecium rutabulum	E0	.	+	.	.	.	.	.	1	14
	Porella platyphylla	E0	.	+	.	.	.	.	.	1	14

vrsto *Paeonia mascula*, torej bližnjo sorodnico vrste *P. officinalis*, po kateri se imenuje lipova združba v Čičariji. Skupno obema združbama je tudi razmeroma obilno pojavljanje še nekaterih bolj ali manj ruderalnih vrst, npr. vrste *Geum urbanum* (Košir & Surina (2005) jo uvrščata celo med diagnostične vrste zveze *Fraxino-Acerion*, kamor po našem mnenju ne sodi) ali vrste *Colchicum autumnale*. Čeprav so tudi sestoji asociacije *Paeonio officinalis-Tilietum platyphylli* po našem mnenju pionirski, bolj ali manj drugotni, so njihova rastišča kljub vsemu precej drugačna, bolj "aceretalna" in tudi človekovi vplivi na njihov nastanek manj očitni in slabo poznani. Zato kljub naštetim florističnim podobnostim preučenih sestojev na Krasu ne moremo uvrstiti v asociacijo *Paeonio officinalis-Tilietum platyphylli*. Začasno jih uvrščamo v novo drugotno asociacijo *Veronico sublobatae-Fraxinetum excelsioris* nom. prov., z razlikovalnimi vrstami *Fraxinus excelsior*, *Ornithogalum umbellatum* in *Veronica sublobata* (= *Veronica hederifolia* subsp. *leucorum*). Izbor razlikovalnic kaže na drugotna rastišča, nastala s človekovo dejavnostjo v preteklosti. Vrsta *Ornithogalum umbellatum* je po razširjenosti (evri)mediteranska in značilna za združbe gojenih travnikov (Aeschimann *et al.*, 2004b; Košir & Surina, 2005), vrsta *Veronica sublobata* pa je po razširjenosti evropska in značilnica zveze *Geo-Alliarion* = *Galio-Alliarion* (Aeschiman *et al.*, 2004b). To je zveza toploljubnih in relativno sušnih nitrofilnih robnih združb (Mucina, 1993). Fischer (1994) jo označuje kot vrsto poplavnih gozdov, senčnih in svežih ruderalnih površin, grmišč, vrtov, tudi njiv, predvsem v submontanskem in spodnjem montanskem pasu. Vreš (1994) je zapisal, da so njena naravna rastišča večinoma vlažna grmišča in gozdovi (logi) v vzhodni Sloveniji, pojavlja pa se tudi na ruderalnih in segetalnih rastiščih. Vsekakor ta vrsta označuje antropogeni izvor opisane pionirske združbe plemenitih listavcev. Sestoje pri vasi Sveto uvrščamo v varianto z vrsto *Smyrnium perfoliatum*. To je (evri)mediteranska vrsta svežih, s hranili bogatih, pogosto ruderalnih rastišč (Aeschimann *et al.*, 2004a; Košir & Surina, 2005), značilna vrsta robne združbe *Smyrnietum perfoliati* Poldini 1989 (Poldini, 1989; Čarni, 1994). Diagnostični za to varianto sta še vrsti *Acer platanoides* in *Tilia platyphyllos*. Naštete razlikovalnice kažejo, da so rastišča pri Svetem bolj kamnita, na bolj plitvih tleh in bolj toploljubna od rastišč pod Železnimi vrati. Tamkajšnje sestoje uvrščamo v varianto z vrsto *Urtica dioica*, razlikovalnice pa so tudi vrste *Glechoma hederacea*, *Cerastium sylvaticum* in *Asarum europaeum* subsp. *caucasicum*. Zadnji dve sta vrsti bukovih oz. bukovo-hrastovih gozdov in morda kažeta na potencialno naravno vegetacijo v kotanji Jezero. Za zdaj le provizorno opisano asociacijo *Veronico sublobatae-Fraxinetum excelsioris* nom. prov. bi po klasifikaciji Košir (2004) lahko uvrstili v podzvezo *Ostryo-Tilienion* P. Košir 2004 in v zvezo *Fraxino-Acerion* Fukarek 1969, če pa izhajamo iz potencialno-naravne vegetacije, je najbrž najbolj ustrezna uvrstitev v podzvezo *Asparago tenuifolii-Carpinenion* Marinček & Poldini 1994 in v zvezo *Erythronio-Carpinion* (Ht. 1938) Marinček in Wallnöfer, Mucina & Grass 1993.

Gozdovi lipe in črnega gabra v Škocjanskih jamah

Škocjanske jame so svetovno znana naravna znamenitost (Debevec *et al.*, 2002), že dolgo privlačna tudi za botanike in fitocenologe (npr. Poldini, 1997; Martinčič, 2001). Shaw (2000) tako objavlja zapiske iz začetka 19. stoletja, ki so jih ob obisku teh jam objavili botaniki Hoppe in Hornschuch (jamo sta obiskala l. 1816) ter Biasoletto (ta je v jame l. 1838 pospremil znanega ljubitelja rastlin in narave, saškega kralja Friderika Avgusta II). Botanični opis Škocjanskih jam je v vodniku o tej naravni znamenitosti prispeval Marchesetti (1887). Kot nahajališče rastlin je to območje pogosto omenjeno v dveh zbirnih delih iz tistega časa, Flori Trsta in okolice (Marchesetti, 1896–97) in Flori avstrijskega Primorja (Pospichal, 1897–99). Botaniki so Škocjanskim jamam v začetku 20. stoletja posvetili tudi ekskurzijo v okviru drugega mednarodnega botaničnega kongresa na Dunaju l. 1905 (Ginzberger & Maly, 1905; Beck, 1906). Fitogeografe so v globokih udornih dolinah presenečale številne vrste hladnejših, gorskih območij, medtem ko so v njihovi bližini opažali prav tako številne toploljubne, submediteranske vrste (Beck, 1906). Med prvimi, ki je v Škocjanskih jamah raziskoval rastje (vegetacijo), je bil Morton (1935). V svoji fitogeografski monografiji je objavil 38 fitocenoloških popisov, ki jih je naredil po standardni srednjeevropski metodi. Združbe je opisoval le na podlagi posameznih popisov, brez vsakršnih analiznih in sinteznih tabel. Tako postavljene sintaksone



Sl. 4: Nahajališča preučenih sestojev lipe in črnega gabra v Škocjanskih jamah in okolici. (Vir: Državna topografska karta RS 1: 25 000, GURS)
Fig. 4: Localities of researched stands of *Tilia platyphyllos* ***and*** *Ostrya carpinifolia* ***in Škocjan Caves and their surroundings. (Source: State topographical map 1: 25 000, GURS)***

kasnejši fitocenologi niso mogli upoštevati, pač pa so lahko uporabili njegove popise in jih z ustrezno tabelarno obdelavo uvrstili v sintaksonomski sistem. To je storil Tomažič (1946), ko je na podlagi Mortonovih popisov iz Škocjanskih in drugih jam opisal dve mezofilni in skiofilni združbi, v katerih prevladujejo mahovi in praproti *(Phyllitideto-Eucladietum verticillati* in *Phyllitideto-Plagiochiletum cavernarum)*. Uspevanje različnih flornih elementov v povezavi z mikroklimo je v Škocjanskih jamah raziskoval Martinčič (1973). Na podlagi raziskav v Veliki dolini je pojasnil pojavljanje glacialnih reliktov nad strugo (ponorom) Reke ter termofilnih (mediteranskih) rastlin 50 m višje, na stropu Schmidlove dvorane. Škocjanske jame so in še obiskujejo tudi številni drugi domači in tuji botaniki (novejše floristične in fitocenološke raziskave sodelavcev Biološkega inštituta ZRC SAZU so v glavnem še neobjavljene, deloma jih povzemata Slapnik, 2002 in Čelik, 2004, prav tako nekateri članki v monografiji o vodi in življenju na Krasu – Babij *et al.*, 2005 in Čarni, 2005). Njihovo okolico omenjajo kot nahajališče redkih rastlin ali kot nahajališča fitocenoloških popisov v preglednih delih (npr. Wraber & Skoberne, 1989; Wraber, 1990; Poldini, 1980, 1989; Piskernik, 1991; Zupančič, 1997, 1999a, b). Sinsistematski pregled gozdnih združb, ki smo jih pri dosedanjih raziskavah ugotovili v Škocjanskih jamah in v njihovi okolici, je naslednji:

Querco-Fagetea Br.-Bl. & Vlieg. 1937
Quercetalia pubescentis Klika 1933
Ostryo-Carpinion orientalis Horvat (1954) em. 1958
Seslerio autumnalis-Ostryetum I. Horvat & Horvatić 1950 corr. Zupančič 1999
Ostryo-Quercetum pubescentis (Ht. 1950) Trinajstić 1974
Amelanchiero ovalis-Ostryetum Poldini (1978) 1982
Fagetalia sylvaticae Pawł. in Pawł. & al. 1928
Erythronio-Carpinion (Ht. 1938) Marinček in Mucina, Wallnöfer & Grass 1993
Asparago tenuifolii-Carpinenion betuli Marinček & Poldini 1994
Asaro-Carpinetum betuli Lausi 1964
Aremonio-Fagion (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989
Polysticho setiferi-Acerenion Borhidi & Kevey 1996
Corydalido ochroleucae-Ostryetum carpinifoliae (Zupančič & Žagar 1995) Zupančič 1997 nom. prov.
Veratro nigri-Fraxinetum excelsioris Dakskobler 2006 mscr.
Saxifrago petraeae-Tilietum platyphylli Dakskobler 1999

Vsaj zadnji dve našteti asociacije bi po klasifikaciji Košir (2004) lahko uvrstili tudi v zvezo *Fraxino-Acerion* Fukarek 1969 in v podzvezo *Ostryo-Tilienion* P. Košir 2004. Negotova je, tudi zaradi nezadostnega gradiva, uvrstitev v višje sintaksonomske enote za doslej le provizorno opisano asociacijo *Corydalido ochroleucae-Ostryetum carpinifoliae*. Zupančič (1997) jo uvršča v zvezo *Quercion pubescentis-petraeae* Br.-Bl. 1931 in v red *Quercetalia pubescentis*, po našem mnenju pa je ustreznejša uvrstitev med bolj mezofilne združbe iz reda *Fagetalia sylvaticae*. Čeprav v drevesni plasti ne prevladujejo plemeniti listavci, jo začasno uvrščamo v njihovo podzvezo.

Na sestoje črnega gabra in plemenitih listavcev (lipe, gorskega javorja) v Škocjanskih jamah je opozoril že Martinčič (1973). Spomladi leta 2001 smo na različnih lokacijah (Sl. 4), geološka podlaga je bil povsod kredni apnenec, naredili osem popisov takšnih sestojev in jih uredili v fitocenološko tabelo (Tab. 3). Po primerjavi s podobnimi združbami (Poldini, 1985, 1989; Accetto, 1991; Zupančič, 1997; Dakskobler, 1999; Košir & Surina, 2005) popisane sestoje začasno uvrščamo v naslednje združbe: popis 1 v provizorno opisano asociacijo *Corydalido ochroleucae-Ostryetum carpinifoliae*, popis 2 v sintakson *Seslerio autumnalis-Ostryetum tilietosum platyphylli* Dakskobler 2004, popisa 3 in 4 v sintakson *Saxifrago petraeae-Tilietum platyphylli* var. geogr. *Helleborus istriacus* var. geogr. nova *(holotypus* je popis 4), popisa 5 in 6 v sintakson *Veratro nigri-Fraxinetum excelsioris* Dakskobler 2006 mscr. var. geogr. *Helleborus istriacus* prov. in popisa 7 in 8 v asociacijo *Asaro-Carpinetum betuli*. Takšna sinsistematska uvrstitev je začasna, saj bi za podrobnejšo primerjavo potrebovali popise podobnih sestojev lipe in črnega gabra iz udornih jam, kotanj in globeli drugod na Krasu. Asociacija *Corydalido-Ostryetum* je bila doslej dokumentirana le z enim popisom iz udorne jame (udor-

Tab. 3: Sestoji črnega gabra in lipe v Škocjanskih jamah.
Tab. 3: Stands of** Ostrya carpinifolia **and** Tilia platyphyllos **in Škocjan Caves.

	Številka popisa (Number of relevé)		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
	Nadmorska višina v m (Altitude in m)		390	370	410	400	350	360	380	350		
	Lega (Aspect)		NW	NW	N	NE	NE	NW	N	NW		
	Nagib v stopinjah (Slope in degrees)		30	40	30	60	30	25	30	35		
	Matična podlaga (Parent material)		A	A	A	A	A	A	A	A		
	Tla (Soil)		Ko	R	R	R	Ko	R	Rj	Rj		
	Kamnitost v % (Stoniness in %)		90	60	80	80	100	30	60	30		
	Zastiranje v % (Cover in %):											
	Zgornja drevesna plast (Upper tree layer)	E3b	70	80	90	90	70	60	80	89		
	Spodnja drevesna plast (Lower tree layer)	E3a	30	20			10	20	10			
	Grmovna plast (Shrub layer)	E2	60	10	15	30	30	20	10	30		
	Zeliščna plast (Herb layer)	E1	70	70	50	50	50	80	60	80		
	Mahovna plast (Moss layer)	E0		20	60	30	60	10	20	10		
	Največji prsni premer (Maximum diameter)	cm	25	30	50	30	40	35	40	40		
	Največja drevesna višina (Maximum height)	m	18	18	20	16	25	20	20	25		
	Velikost popisne ploskve (Relevé area)	m2	400	400	400	200	400	400	400	400		
	Število vrst (Number of species)		68	67	71	58	68	85	61	64		
	Razlikovalnice asociacij (Diiferential species of associations)										Fr.	Pr.
QP	*Ostrya carpinifolia*	E3b	3	+	4	2	1	1	1	+	8	100
QP	*Ostrya carpinifolia*	E3a	.	1	.	.	.	+	.	+	3	38
QP	*Ostrya carpinifolia*	E2b	+	1	.	.	.	.	.	.	2	25
QP	*Fraxinus ornus*	E3b	.	.	.	+	.	+	+	.	3	38
QP	*Fraxinus ornus*	E3a	1	1	1	+	+	1	1	.	7	88
QP	*Fraxinus ornus*	E2b	1	.	+	.	.	.	.	.	2	25
QP	*Fraxinus ornus*	E2a	.	1	+	+	.	.	.	.	3	38
AT	*Pseudofumaria alba*	E1	1	.	+	+	.	r	.	.	4	50
QF	*Veratrum nigrum*	E1	1	1	+	+	1	1	1	1	8	100
TA	*Tilia platyphyllos*	E3b	.	3	2	3	3	2	2	2	7	88
TA	*Tilia platyphyllos*	E3a	.	1	1	+	.	+	+	+	6	75
TA	*Tilia platyphyllos*	E2b	.	1	1	1	.	.	.	.	3	38
TA	*Tilia platyphyllos*	E2a	+	1	.	.	.	+	+	.	4	50
TA	*Tilia platyphyllos*	E1	+	.	.	.	.	.	.	.	1	13
AT	*Saxifraga petraea*	E1	r	.	+	1	.	.	.	.	3	38
TA	*Lunaria rediviva*	E1	.	.	.	.	2	+	.	.	2	25
TA	*Adoxa moschatellina*	E1	.	.	.	.	+	+	.	.	2	25
PA	*Stellaria montana*	E1	.	.	.	.	1	.	.	.	1	13
TA	*Circaea intermedia*	E1	.	.	.	.	r	.	.	.	1	13
TA	*Circaea lutetiana*	E1	.	.	.	.	+	.	.	.	1	13
TA	*Aconitum lycoctonum*	E1	.	.	.	.	.	2	.	.	1	13
TA	*Fraxinus excelsior*	E3b	.	.	.	.	.	1	.	.	1	13
TA	*Fraxinus excelsior*	E2a	.	.	.	.	.	+	.	.	1	13
PA	*Isopyrum thalictroides*	E1	.	+	2	.	+	1	1	1	6	75
F	*Carpinus betulus*	E3b	.	.	.	.	.	.	1	3	2	25
F	*Carpinus betulus*	E3a	.	.	+	.	.	.	+	1	3	38
F	*Carpinus betulus*	E2b	.	.	.	.	.	+	+	+	3	38
F	*Carpinus betulus*	E2a	.	.	.	.	.	.	+	.	1	13
QF	*Scilla bifolia*	E1	.	.	+	.	.	.	+	.	2	25
	Geografska razlikovalna vrsta (Phytogeographical diff. sp.)											
QP	*Helleborus odorus* var. *istriacus*	E1	.	1	+	+	.	1	1	.	5	63
PA	***Polysticho setiferi-Acerenion***											
	Lamium orvala	E1	1	.	+	+	+	1	.	+	6	75
TA	***Tilio-Acerion* (*Fraxino-Acerion* sensu P. Košir)**											
	Geranium robertianum	E1	1	.	1	1	1	+	+	.	6	75
	Staphylea pinnata	E2b	.	.	.	+	1	.	.	1	3	38

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7	8		
	Staphylea pinnata	E2a	.	+	.	1	1	.	1	1	5	63
	Corydalis solida	E1	.	.	1	+	1	1	.	.	4	50
	Aruncus dioicus	E1	.	.	.	.	+	1	1	1	4	50
	Acer pseudoplatanus	E2a	+	.	+	.	.	.	.	+	3	38
	Acer pseudoplatanus	E2b	.	.	.	.	.	.	.	+	1	13
	Euonymus latifolia	E2a	+	.	.	.	+	.	.	+	3	38
	Thalictrum aquilegiifolium	E1	.	.	+	.	.	+	.	.	2	25
	Acer platanoides	E2a	.	.	+	.	.	.	+	.	2	25
	Ulmus glabra	E3b	.	.	.	.	.	.	+	.	1	13
	Ulmus glabra	E2b	.	.	.	.	.	.	.	+	1	13
	Ulmus glabra	E2a	.	.	.	.	.	.	.	+	1	13
AF	***Aremonio-Fagion***											
	Cyclamen purpurascens	E1	1	1	2	1	+	.	1	+	7	88
	Cardamine enneaphyllos	E1	2	.	.	+	.	1	.	.	3	38
	Geranium nodosum	E1	.	.	+	.	+	.	.	1	3	38
	Daphne laureola	E2a	.	+	.	.	.	.	+	.	2	25
	Hacquetia epipactis	E1	.	.	.	.	.	1	.	1	2	25
	Aposeris foetida	E1	.	.	.	.	.	.	.	+	1	13
EC	***Erythronio-Carpinion***											
	Galanthus nivalis	E1	1	+	1	1	+	2	1	1	8	100
	Primula vulgaris	E1	.	+	+	+	.	1	1	+	6	75
AU	***Alno-Ulmion***											
	Viburnum opulus	E2a	.	.	.	.	.	+	+	.	2	25
	Rubus caesius	E2a	+	.	.	.	.	.	.	.	1	13
	Chrysosplenium alternifolium	E1	.	.	.	.	1	.	.	.	1	13
	Solanum dulcamara	E1	.	.	.	.	.	+	.	.	1	13
F	***Fagetalia sylvaticae***											
	Polygonatum multiflorum	E1	+	1	1	+	+	1	1	1	8	100
	Asarum europaeum subsp. *caucasicum*	E1	+	+	+	.	+	1	+	+	7	88
	Mycelis muralis	E1	+	+	+	+	+	.	+	+	7	88
	Campanula trachelium	E1	+	+	.	+	.	+	+	+	6	75
	Lathyrus vernus	E1	1	.	+	.	+	1	+	+	6	75
	Salvia glutinosa	E1	+	+	+	.	+	.	+	+	6	75
	Sambucus nigra	E2b	.	.	+	.	1	.	.	.	2	25
	Sambucus nigra	E2a	+	.	1	+	1	+	.	+	6	75
	Symphytum tuberosum	E1	+	.	+	+	+	+	.	1	6	75
	Pulmonaria officinalis	E1	.	+	.	.	+	+	+	+	5	63
	Euphorbia dulcis	E1	.	.	+	.	+	1	.	+	4	50
	Galeobdolon flavidum	E1	+	.	1	.	+	+	.	.	4	50
	Heracleum sphondylium	E1	+	.	+	.	.	+	+	.	4	50
	Mercurialis perennis	E1	.	.	+	.	.	+	+	+	4	50
	Phyllitis scolopendrium	E1	.	.	1	+	3	.	+	.	4	50
	Dryopteris filix-mas	E1	+	.	+	.	+	.	+	.	4	50
	Galium laevigatum	E1	.	+	.	.	.	.	+	+	3	38
	Corydalis cava	E1	.	.	.	.	+	+	.	.	2	25
	Dactylis polygama	E1	.	.	.	.	.	+	.	+	2	25
	Daphne mezereum	E2a	.	.	.	.	+	.	+	.	2	25
	Viola reichenbachiana	E1	.	.	.	.	.	+	.	+	2	25
	Lilium martagon	E1	.	.	.	.	.	.	1	1	2	25
	Tilia cordata	E3b	.	.	.	.	.	.	r	+	2	25
	Tilia cordata	E3a	.	.	.	.	.	.	r	+	2	25
	Cardamine impatiens	E1	.	.	.	.	+	.	.	.	1	13
	Ranunculus lanuginosus	E1	.	.	.	.	+	.	.	.	1	13
	Melica nutans	E1	.	.	.	.	.	+	.	.	1	13
	Actaea spicata	E1	.	.	.	.	.	+	.	.	1	13
	Prunus avium	E3b	.	.	.	.	.	.	1	.	1	13
	Prunus avium	E2a	.	.	.	.	.	.	.	+	1	13
	Allium ursinum	E1	.	.	.	.	.	.	.	4	1	13
	Fagus sylvatica	E2b	.	.	.	.	.	.	.	r	1	13
	Festuca altissima	E1	.	.	.	.	.	.	.	1	1	13
	Prenanthes purpurea	E1	.	.	.	.	.	.	.	+	1	13

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7	8		
QP	***Quercetalia pubescentis***											
	Arabis turrita	E1	+	1	1	1	+	+	+	.	7	88
	Euonymus verrucosa	E2a	+	1	1	1	.	.	+	+	6	75
	Sesleria autumnalis	E1	+	3	.	1	.	+	1	+	6	75
	Cornus mas	E2b	+	.	.	1	.	+	+	.	4	50
	Cornus mas	E2a	.	.	.	.	.	.	+	.	1	13
	Mercurialis ovata	E1	+	+	+	.	.	+	.	.	4	50
	Acer monspessulanum	E3b	.	1	.	+	.	.	+	.	3	38
	Acer monspessulanum	E3a	.	1	r	.	.	.	.	.	2	25
	Acer monspessulanum	E2b	.	+	.	.	.	.	.	.	1	13
	Acer monspessulanum	E2a	.	+	+	.	.	.	.	.	2	25
	Acer monspessulanum	E1	.	+	.	.	.	.	.	.	1	13
	Campanula persicifolia	E1	.	+	.	+	.	.	+	.	3	38
	Aristolochia lutea	E1	.	+	.	.	.	+	.	.	2	25
	Melittis melissophyllum	E1	.	+	.	+	.	.	.	.	2	25
	Ruscus aculeatus	E2a	.	.	.	.	.	.	+	1	2	25
	Hierochloë australis	E1	.	1	.	.	.	.	.	.	1	13
	Frangula rupestris	E2a	.	+	.	.	.	.	.	.	1	13
	Cnidium silaifolium	E1	.	+	.	.	.	.	.	.	1	13
	Quercus cerris	E3b	.	+	.	.	.	.	.	.	1	13
	Tanacetum corymbosum	E1	.	+	.	.	.	.	.	.	1	13
	Convallaria majalis	E1	.	.	.	.	.	+	.	.	1	13
	Lathyrus venetus	E1	.	.	.	.	.	+	.	.	1	13
	Sorbus aria	E3b	.	.	.	.	.	+	.	.	1	13
	Sorbus aria	E3a	.	.	.	.	.	+	.	.	1	13
	Sorbus aria	E2b	.	.	.	.	.	+	.	.	1	13
QF	***Querco-Fagetea***											
	Hepatica nobilis	E1	+	1	2	1	+	1	1	+	8	100
	Carex digitata	E1	+	+	+	+	.	1	+	+	7	88
	Hedera helix	E3a	.	.	1	+	1	.	1	+	5	63
	Hedera helix	E2a	.	.	.	+	.	.	.	.	1	13
	Hedera helix	E1	+	1	1	1	+	.	1	1	7	88
	Corylus avellana	E3a	.	.	.	.	1	2	.	.	2	25
	Corylus avellana	E2b	+	.	+	+	1	1	+	+	7	88
	Corylus avellana	E2a	.	.	.	.	+	.	+	.	2	25
	Acer campestre	E3b	+	.	.	.	r	2	+	+	5	63
	Acer campestre	E3a	.	.	+	+	+	.	1	.	4	50
	Acer campestre	E2b	.	.	+	.	.	.	.	.	1	13
	Acer campestre	E2a	.	+	.	.	.	.	.	+	2	25
	Acer campestre	E1	+	.	.	.	.	+	.	.	2	25
	Anemone ranunculoides	E1	.	.	+	.	+	1	2	1	5	63
	Festuca heterophylla	E1	.	.	+	+	.	.	+	.	3	38
	Lonicera xylosteum	E2a	+	.	1	.	.	+	.	.	3	38
	Moehringia trinervia	E1	.	.	.	+	+	.	.	+	3	38
	Aegopodium podagraria	E1	.	.	.	.	+	.	.	+	2	25
	Clematis vitalba	E2b	+	.	.	.	.	.	.	.	1	13
	Clematis vitalba	E2a	+	.	.	.	.	.	.	.	1	13
	Clematis vitalba	E1	.	+	.	.	.	+	.	.	2	25
	Stellaria holostea	E1	.	.	1	+	.	.	.	.	2	25
	Gagea lutea	E1	.	.	.	.	+	+	.	.	2	25
	Pyrus pyraster	E3a	.	+	.	.	.	.	.	.	1	13
	Ranunculus ficaria	E1	.	.	.	.	+	.	.	.	1	13
	Viola mirabilis	E1	.	.	.	.	.	1	.	.	1	13
	Quercus petraea	E3b	.	.	.	.	.	+	.	.	1	13
	Cerastium sylvaticum	E1	.	.	.	.	.	+	.	.	1	13
	Fragaria moschata	E1	.	.	.	.	.	+	.	.	1	13
	Lathraea squamaria	E1	.	.	.	.	.	.	.	+	1	13
	Melica uniflora	E1	.	.	.	.	.	.	.	+	1	13
RP	***Rhamno-Prunetea***											
	Euonymus europaea	E2a	+	+	1	+	+	+	1	.	7	88

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7	8		
	Euonymus europaea	E2b	.	.	.	+	.	.	.	.	1	13
	Euonymus europaea	E1	.	.	.	+	.	+	.	.	2	25
	Cornus sanguinea	E2a	.	1	.	.	.	1	.	.	2	25
	Cornus sanguinea	E2b	+	1	.	.	.	1	.	.	3	38
	Crataegus monogyna	E2b	.	+	.	.	.	.	.	.	1	13
	Crataegus monogyna	E2a	.	+	.	.	.	+	.	.	2	25
	Rosa canina agg.	E2a	+	.	.	.	.	.	.	.	1	13
	Rosa sp.	E2a	.	+	.	.	.	.	.	.	1	13
EP	***Erico-Pinetea***											
	Calamagrostis varia	E1	.	.	.	1	.	.	.	.	1	13
VP	***Vaccinio-Piceetea***											
	Oxalis acetosella	E1	+				1	2			3	38
	Abies alba	E2a								+	1	13
	Abies alba	E1							+		1	13
TG	***Trifolio-Geranietea***											
	Valeriana collina	E1	+	+	+	+	.	+	.	.	5	63
	Digitalis grandiflora	E1	+	+	.	+	.	.	+	.	4	50
	Campanula rapunculoides	E1	.	+	.	.	.	+	.	.	2	25
	Lilium bulbiferum	E1	+	.	.	.	.	+	.	.	2	25
	Aconitum anthora	E1	.	.	+	.	.	.	.	.	1	13
	Iris graminea	E1	.	+	.	.	.	.	.	.	1	13
	Silene nutans	E1	.	+	.	.	.	.	.	.	1	13
FB	***Festuco-Brometea***											
	Campanula glomerata	E1	+	.	.	.	.	.	.	.	1	13
	Dianthus monspessulanus	E1	.	+	.	.	.	.	.	.	1	13
MA	***Molinio-Arrhenatheretea***											
	Veronica chamaedrys	E1	.	+	.	+	.	+	.	.	3	38
MuA	***Mulgedio-Aconitetea***											
	Senecio nemorensis agg.	E1	+	+	+	.	+	+	1	+	7	88
	Senecio fuchsii	E1	.	.	.	.	.	+	.	+	2	25
	Aconitum variegatum	E1	.	.	.	.	.	.	.	+	1	13
AT	***Asplenietea trichomanis***											
	Asplenium trichomanes	E1	1	1	1	1	+	+	+	+	8	100
	Ceterach officinarum s. lat.	E1	+	+	+	+	+	+	.	+	7	88
	Polypodium vulgare	E1	+	1	1	1	+	.	1	+	7	88
	Cardaminopsis arenosa	E1	+	1	+	+	+	+	.	.	6	75
	Moehringia muscosa	E1	+	1	+	1	.	.	.	.	4	50
	Sedum maximum	E1	+	1	+	+	.	.	.	.	4	50
	Polypodium interjectum	E1	.	1	1	2	+	.	.	.	4	50
	Campanula pyramidalis	E1	.	+	.	.	.	.	.	.	1	13
	Saxifraga crustata	E1	r	.	.	.	.	.	.	.	1	13
	Asplenium ruta-muraria	E1	.	.	.	.	+	.	.	.	1	13
GU	***Galio-Urticetea***		.	.	.	.	.	.	.	.		
	Geranium lucidum	E1	+	.	1	.	.	.	.	.	2	25
	Geum urbanum	E1	.	.	+	.	.	+	.	.	2	25
	Galium aparine	E1	.	.	1	.	.	.	.	.	1	13
	Glechoma hederacea	E1	.	.	+	.	.	.	.	.	1	13
	Urtica dioica	E1	.	.	.	.	+	.	.	.	1	13
O	**Druge vrste (Other species)**											
	Allium sp.	E1	+	.	.	.	.	.	.	.	1	13
	Juniperus communis	E2b	.	+	.	.	.	.	.	.	1	13
	Alnus glutinosa	E3b	.	.	.	.	r	.	.	.	1	13
ML	**Mahovi in lišaji (Mosses and lichens)**											
	Isothecium alopecuroides	E0	2	.	2	2	1	1	1	+	7	88
	Neckera complanata	E0	+	1	+	1	.	+	+	+	7	88
	Neckera crispa	E0	+	2	1	1	.	2	1	+	7	88
	Ctenidium molluscum	E0	2	2	1	.	1	2	1	.	6	75
	Anomodon viticulosus	E0	+	1	+	1	.	+	.	.	5	63
	Brachythecium rutabulum	E0	.	+	1	.	1	.	1	+	5	63
	Thuidium tamariscinum	E0	+	+	+	.	.	+	.	.	4	50

	Številka popisa (Number of relevé)		1	2	3	4	5	6	7	8		
	Homalothecium lutescens	E0	+	.	.	+	.	1	.	.	3	38
	Rhytidiadelphus triquetrus	E0	+	1	.	.	.	+	.	.	3	38
	*Peltigera praetextata**	E0	.	.	+	+	+	.	.	.	3	38
	Anomodon attenuatus	E0	.	.	+	.	.	1	+	.	3	38
	Eurhynchium striatum	E0	1	.	.	.	1	.	.	.	2	25
	Homalothecium sericeum	E0	+	.	.	+	.	.	.	.	2	25
	Plagiomnium undulatum	E0	+	.	.	.	+	.	.	.	2	25
	Plagiochila porelloides	E0	+	.	.	.	.	.	+	.	2	25
	Metzgeria furcata	E0	.	.	.	+	+	.	.	.	2	25
	Thamnobryum alopecurum	E0	.	.	+	.	2	.	.	.	2	25
	Porella platyphylla	E0	.	.	.	+	.	+	.	.	2	25
	Brachythecium sp.	E0	+	.	.	.	.	.	.	.	1	13
	Homalothecium philippeanum	E0	.	+	.	.	.	.	.	.	1	13
	Polytrichum formosum	E0	.	+	.	.	.	.	.	.	1	13
	Plagiochila asplenioides	E0	.	.	.	.	1	.	.	.	1	13
	Conocephalum conicum	E0	.	.	.	.	+	.	.	.	1	13
	Fissidens dubius	E0	.	.	.	.	+	.	.	.	1	13
	Mnium thomsonii	E0	.	.	.	+	.	.	.	.	1	13
	Hypnum cupressiforme	E0	.	.	.	.	.	+	.	.	1	13
	Mnium sp.	E0	.	.	.	.	.	+	.	.	1	13
	Fissidens taxifolius	E0	.	.	.	.	.	.	.	+	1	13
	Brachythecium velutinum	E0	.	.	.	.	.	.	.	+	1	13

* det. B. Surina

1 *Corydalido ochroleucae-Ostryetum carpinifoliae*
2 *Seslerio autumnalis-Ostryetum tilietosum platyphylli*
3, 4 *Saxifrago petraeae-Tiletum platyphylli*
5, 6 *Veratro nigri-Fraxinetum*
7, 8 *Asaro-Carpinetum betuli*

nice) Risnik pri Divači (Zupančič, 1997), asociacija *Veratro nigri-Fraxinetum* pa je po naših spoznanjih (neobjavljeno) submediteransko-predalpska oblika (forma) asociacije *Hacquetio-Fraxinetum excelsioris* Marinček in Wallnöfer, Mucina & Grass 1993, ki jo zaradi nomenklaturnih razlogov (Kodeks fitocenološke nomenklature ne obravnava ranga forme) in, če upoštevamo členitev Košir (2004), pripadnosti podzvezi *Ostryo-Tilienion* (asociacijo *Hacquetio-Fraxinetum* Košir uvršča v podzvezo *Fraxino-Acerenion),* vrednotimo na rangu asociacije. Sestoja, ki smo ju popisali v Škocjanskih jamah, sta podobna sestojem te asociacije v Posočju po razlikovalnih vrstah *(Tilia platyphyllos, Veratrum nigrum*, *Fraxinus ornus*, *Ostrya carpinifolia)*. Te so sicer razlikovalne tudi za asociacijo *Saxifrago-Tilietum*, a v njenih sestojih navadno ne uspevajo ali so zelo redke "aceretalne" vrste kot so *Lunaria rediviva*, *Adoxa moschatellina*, *Stellaria montana*, *Circaea intermedia*, *Aconitum lycoctonum*, ki so torej lokalne razlikovalnice nasproti asociaciji *Saxifrago-Tilietum*. Taka razlikovalnica je tudi veliki jesen (*Fraxinus excelsior*), čeprav se v našem primeru pojavlja le v enem popisu. Istrski teloh *(Helleborus odorus var. istriacus)* je geografska razlikovalna vrsta, ki dobro označuje kraške (jugozahodnoprimorske) sestoje obeh primerjanih asociacij, *Saxifrago-Tilietum* in *Veratro nigri-Fraxinetum*. Pojavljanje vrste *Pseudofumaria alba* (= *Corydalis ochroleuca)* kaže tudi na določen prehod oz. stik sestojev ekološko in floristično nekoliko podobnih asociacij *Saxifrago-Tilietum* in *Corydalido ochroleucae-Aceretum*. Zaradi redke primesi gorskega javorja je uvrstitev sestojev lipe in črnega gabra v Škocjanskih jamah v asociacijo *Corydalido ochroleucae-Aceretum* po našem mnenju manj ustrezna, mogoča bi bila le uvrstitev v subasociacijo *Corydalido ochroleucae-Aceretum tilietosum platyphylli* P. Košir & Surina in P. Košir 2004.

ZAKLJUČKI

Pri raziskavah gozdne vegetacije Krasa v zahodni Sloveniji smo v zadnjih letih ugotovili nekaj za to območje novih združb. Bukov gozd v kotanji Draga pri Ponikvah uspeva na jerovici (kremenici – *Dystric Cambisols)* in ga uvrščamo v asociacijo *Ornithogalo pyrenaici-Fagetum*. Pionirski sestoji plemenitih listavcev pri Svetem in pod Železnimi vrati severovzhodno pod Trsteljem so nastali na površinah, kjer so bili v prvi svetovni vojni vojaški objekti oz. vojaška taborišča. Močni človekovi vplivi se še danes kažejo v nitrofilnem rastju, ki je značilno za ruderalne združbe in ki ga v drugih doslej opisanih združbah plemenitih listavcev v Sloveniji v takšni množini nismo opazili. Nekatere diagnostične vrste teh drugotnih sestojev (npr. *Smyrnium perfoliatum* in *Ornithogalum umbellatum)* so sicer razlikovalne tudi za asociacijo *Paeonio officinalis-Tilietum platyphylli* (opisana je bila v slovenskem delu Čičarije),

a njihova celotna floristična sestava je svojevrstna, zato jih začasno uvrščamo v provizorno opisano novo asociacijo *Veronico sublobatae-Fraxinetum excelsioris* nom. prov.

V botanično in fitocenološko že precej raziskanih Škocjanskih jamah in njihovi okolici smo ugotovili fragmentarno razvite sestoje asociacij *Corydalido-Ostryetum*, *Saxifrago petraeae-Tilietum platyphylli*, *Veratro nigri-Fraxinetum* in *Asaro-Carpinetum*. Potrebne bodo raziskave podobnih sestojev lipe in črnega gabra v drugih udornih jamah in kotanjah na Krasu.

Ugotavljamo, da je takson *Helleborus odorus* var. *istriacus* dobra geografska razlikovalnica preučenih gozdnih združb na Krasu, saj jih razlikuje od podobnih združb v Posočju.

ZAHVALA

Dr. Metka Culiberg me je opozorila na bukov gozd v kotanji Draga pri Ponikvah, dr. Valerija Babij in dr. Tatjana Čelik pa ste mi pokazali pionirske sestoje plemenitih listavcev pri Svetem. Literaturo o vojaški dejavnosti med prvo svetovno vojno na Krasu mi je svetoval Gregor Podgornik, številne koristne podatke o tem pa mi je ljubeznivo v pismu posredoval Mitja Močnik. Dr. Andrej Mihevc mi je pomagal z razlago geomorfoloških pojmov, mi posredoval podatke o pojavljanju bukve na Krasu in me opozoril na ustrezno literaturo. Dr. Boštjan Surina me je spremljal pri popisih v Škocjanskih jamah, mi priskrbel starejše botanične vire o njih in mi določil lišajsko vrsto *Peltigera praetextata*. Dr. Branko Vreš mi je potrdil pravilno določitev vrste *Veronica sublobata*. V pismu mi je svoj pogled na bukov gozd pri Ponikvah sporočil zdaj žal že pokojni dr. Milan Piskernik. Problematiko višjih sintaksonomskih enot ruderalnih združb mi je pojasnil dr. Urban Šilc. Prevod izvlečka in povzetka v angleščino je opravila Andreja Šalamon Verbič. Vsem iskrena hvala, prav tako obema neimenovanima recenzentoma za tehtne pripombe. Raziskave na Krasu smo opravili v okviru projektov Flora, favna in vegetacija Regijskega parka Škocjanske jame (denarno so ga podprli Ministrstvo za znanost in tehnologijo RS, Javni zavod Park Škocjanske jame in SAZU) in Kras – biodiverziteta območja, vpliv zaraščanja ter naravovarstveni pomen (denarno ga podpirata Agencija Republike Slovenije za raziskovalno dejavnost in SAZU).

A CONTRIBUTION TO THE KNOWLEDGE OF THE FOREST VEGETATION OF KRAS (SOUTHWESTERN SLOVENIA)

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SUMMARY

During our fieldwork carried out in the Slovene Karst (Kras) in 2001 and 2005, some interesting forest stands were recorded through the standard Central-European method. The collected relevés were entered into the FloVegSi database and mutually compared with methods of hierarchical classification and with the ordination method of principal coordinates analysis (PCoA).

*The steep slopes of the deep hollow depression Draga near the village of Ponikve are overgrown with beech forest. Owing to the addition of chert, the soil there is deep and slightly acid. This soil is jerovica, or, because of the chert skeleton, probably its subtype kremenica (*Dystric Cambisols*). Two relevés were made here and the beech stand was classified into the subassociation* Ornithogalo pyrenaici-Fagetum fraxinetosum orni*, so far known above all in the flysch region of Goriška Brda. Phytogeographically, the studied beech forest is treated as a new geographical variant* Ornithogalo pyrenaici-Fagetum *var. geogr.* Helleborus istriacus *var. geogr. nova. In Draga near Ponikve, beech has probably been preserved due to the considerable steepness of the slopes, the deep soil (kremenica) and the colder local climate.*

Pioneer stands of valuable broad-leaved trees near the village of Sveto and under Železna vrata in the northeast under Trstelj originated on surfaces where the First World War military facilities or military camps had been put up. Strong human influence is still reflected today in the nitrophilous vegetation characteristic of ruderal communities. This vegetation has not been detected in such a great number in similar so far described communities of valuable broad-leaved trees in Slovenia, which is why these pioneer stands are classified within a provisionally described new association Veronico sublobatae-Fraxinetum excelsioris *nom. prov. Their species composition indicates potential*

*sites of the sub-Mediterranean hornbeam forest (*Ornithogalo pyrenaici-Carpinetum ostryetosum *or* Asaro-Carpinetum betuli*). The differential species of the association are* Fraxinus excelsior, Ornithogalum umbellatum *and* Veronica sublobata *(=* Veronica hederifolia *subsp. leucorum). Two variants are distinguished here: the variant with* Smyrnium perfoliatum *(also differential are the species* Acer platanoides *and* Tilia platyphyllos*) on more shallow and stony soil, and the variant with* Urtica dioica *on deep brown soil (its differential taxa are also* Glechoma hederacea, Cerastium sylvaticum *and* Asarum europaeum *subsp.* caucasicum*). As we consider the potentially natural vegetation to be our starting point, the association* Veronico sublobatae-Fraxinetum excelsioris *is classified into the suballiance* Asparago tenuifolii-Carpinenion *and into the alliance* Erythronio-Carpinion.

In the spring of 2001, we made eight relevés of hop hornbeam and valuable broad-leaved trees (lime, sycamore maple) stands on various localities in the Škocjan Caves and arranged them into phytosociological table. After comparing them with similar communities, we temporarily classified them into the following syntaxa: Corydalido ochroleucae-Ostryetum carpinifoliae, Seslerio autumnalis-Ostryetum tilietosum platyphylli, Saxifrago petraeae-Tilietum platyphylli *var. geogr.* Helleborus istriacus *var. geogr. nova,* Veratro nigri-Fraxinetum excelsioris *var. geogr.* Helleborus istriacus *prov., and* Asaro-Carpinetum betuli*. This synsystematic classification is only temporary, as a more detailed comparison would require relevés of similar lime and hop hornbeam stands from collapse dolines, hollow depressions and dells elsewhere in Kras.*

Key words: phytosociology, synsystematics, noble deciduous trees, *Aremonio-Fagion, Erythronio-Carpinion, Ostryo-Tilienion*, Škocjan Caves, Slovenia

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DODATEK / APPENDIX

Seznam nahajališč fitocenoloških popisov (Localities of relevés):

Tab. 1: **1**. Draga: 0249/1, 411932, 5072346, 15. 4. 2005; **2.** Draga: 0249/1, 411931, 5072373, 15. 4. 2005.

Tab. 2: **1.** Sveto: 0148/3, 401494, 5076688, 10. 5. 2005; **2.** Sveto: 0148/3, 401535, 5076684, 10. 5. 2005, **3.** Sveto: 0148/3, 401467, 5076678, 10. 5. 2005; **4.** Sveto: 0148/3, 401558, 507694, 10. 5. 2005; **5.** Jezero: 0148/1, 400793, 5080508, 10. 5. 2005; **6.** Jezero, 0148/1, 400796, 5080452, 10. 5. 2005; **7.** Jezero, 0148/1, 400831, 5080357, 10. 5. 2005.

Tab. 3: **1.** Dol. Lisičina: 0349/2, 421774, 5058692, 10. 5. 2001; **2.** Velika dolina: 0342/2, 421708, 5058301, 10. 4. 2001; **3.** Mala dolina: 0349/2, 421777, 5058290, 10. 4. 2001; **4.** Mala dolina: 0349/2, 421806, 5058322, 10. 4. 2001; **5.** Mala dolina, 0349/2, 421822, 5058360, 10. 4. 2001; **6.** Dol. Lisičina: 0349/2, 421737, 5058748, 10. 4. 2001; **7.** Velika dolina, 0349/2, 421708, 5058301, 10. 4. 2001; **8.** Velika dolina, 0349/2, 421744, 5058418, 10. 4. 2001.

Seznam sintaksonov z njihovimi avtorji (List of syntaxa with authors):

Zveze in višje sintaksonomske enote (Suballiances and higher syntaxonomical units)
AF *Aremonio-Fagion* (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989

AC *Asparago tenuifolii-Carpinenion* Marinček & Poldini 1994
AT *Asplenietea trichomanis* Br.-Bl. in Meier & Br.-Bl. 1934
AV *Artemisietea vulgaris* Lohmeyer & al. in R. Tx. 1950
GA *Geo-Alliarion* Lohmeyer & Oberdorfer ex Görs & Müller 1969 = *Galio-Alliarion* (Oberd. 1957) Lohmeyer & Oberdorfer in Oberdorfer & al. 1967
GU *Galio-Urticetea* Passarge ex Kopecký 1969
EC *Erythronio-Carpinion* (Ht. 1938) Marinček in Mucina, Wallnöfer & Grass 1993
EP *Erico-Pinetea* I. Horvat 1959
F *Fagetalia sylvaticae* Pawł. in Pawł. & al. 1928
FA *Fraxino-Acerion* Fukarek 1969
FA1 *Fraxino-Acerenion* P. Košir 2004
FB *Festuco-Brometea* Br.-Bl. & Tx. 1943
MA *Molinio-Arrhenatheretea* R. Tx. 1937 em. R. Tx. 1970
MuA *Mulgedio-Aconitetea* Hadač & Klika in Klika 1944
OC *Ostryo-Carpinion orientalis* Horvat (1954) em. 1958
OT *Ostryo-Tilienion* P. Košir 2004
PA *Polysticho setiferi-Acerenion pseudoplatani* Borhidi & Kevey 1996
PT *Poo alpinae-Trisetalia* Elmauer & Mucina 1993
QF *Querco-Fagetea* Br.-Bl. & Vlieg. 1937
QP *Quercetalia pubescentis* Klika 1933
QRP *Quercetalia roboris-petraeae* R. Tx. 1931
RP *Rhamno-Prunetea* Rivas Goday & Borja Carbonell ex R. Tx. 1962
ST *Stellarietea mediae* R. Tx., Lohmeyer & Preising in R. Tx. 1950
TA *Tilio platyphylli-Acerion pseudoplatani* Klika 1955 (= *Lunario-Acerion* Moor 1973)
TG *Trifolio-Geranietea* Th. Müller 1961
VP *Vaccinio-Piceetea* Br.-Bl. 1939 emend. Zupančič (1976) 2000

Asociacije in nižje sintaksonomske enote (Associations and lower units)

Asaro-Carpinetum betuli Lausi 1964
Corydalido ochroleucae-Aceretum Accetto 1991
Corydalido ochroleucae-Aceretum Accetto 1991 *tilietosum platyphylli* P. Košir & Surina in P. Košir 2004
Corydalido ochroleucae-Ostryetum carpinifoliae (Zupančič & Žagar 1995) Zupančič 1997 nom. prov.
Hacquetio-Fraxinetum Marinček in Wallnöfer, Mucina & Grass 1993
Ornithogalo pyrenaici-Carpinetum betuli Marinček, Poldini & Zupančič ex Marinček 1994 *ostryetosum carpinifoliae* Marinček, Poldini & Zupančič 1983
Ornithogalo pyrenaici-Fagetum Marinček, Papež, Dakskobler & Zupančič 1990
Ornithogalo pyrenaici-Fagetum Marinček, Papež, Dakskobler & Zupančič 1990 *fraxinetosum orni* Dakskobler 1996
Ornithogalo pyrenaici-Fraxinetum Čušin & Dakskobler 2006 nom. prov.
Paeonio officinalis-Tilietum platyphylli P. Košir & Surina 2005
Saxifrago petraeae-Tilietum platyphylli Dakskobler 1999 var. geogr. *Helleborus istriacus* var. geogr. nova
Seslerio autumnalis-Fagetum (Ht.) M. Wraber ex Borhidi 1963
Seslerio autumnalis-Ostryetum I. Horvat & Horvatić 1950 corr. Zupančič 1999
Seslerio autumnalis-Ostryetum I. Horvat & Horvatić 1950 corr. Zupančič 1999 *tilietosum platyphylli* Dakskobler 2004
Veratro nigri-Fraxinetum excelsioris Dakskobler 2006 mscr. var. geogr. *Helleborus istriacus* prov.
Veronico sublobatae-Fraxinetum excelsioris Dakskobler 2006 nom. prov.

OKRAJŠAVE IN SIMBOLI / ABBREVIATIONS

Geološka podlaga (Parent material)
A: apnenec / limestone
R: roženec / chert

Talni tipi (Soil types)
DC: kremenica (distrična rjava tla) / dystric cambisols
Ko: koluvialna tla / colluvial soil
R: rendzina / rendzina
Rj: rjava pokarbonatna tla / brown calcareous soil

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HETEROPTERA OF SLOVENIA, III: MIRIDAE

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ABSTRACT

260 species of plant bugs (Miridae) from Slovenia are listed. Finds of 20 species and one subspecies are reported for the first time: Dicyphus albonasutus *Wagner, 1951,* Dicyphus stachydis wagneri *Tamanini, 1956,* Deraeocoris flavilinea *(A. Costa, 1862),* Phytocoris austriacus *Wagner, 1954,* Polymerus microphthalmus *(Wagner, 1951),* Strongylocoris steganoides *(J. Sahlberg, 1875),* Globiceps novaki *Wagner, 1950,* Orthotylus rubidus *(Puton, 1874),* Orthotylus tenellus *(Fallén, 1807),* Hypseloecus visci *(Puton, 1888),* Europiella decolor *(Uhler, 1893),* Macrotylus atricapillus *(Scott, 1872),* Macrotylus paykullii *(Fallén, 1807),* Megalodactylus macularubra *(Mulsant & Rey, 1852),* Psallus wagneri *Ossiannilsson, 1953,* Psallus nigripilis *(Reuter, 1888),* Psallus anaemicus *Seidenstücker, 1966,* Psallus lentigo *Seidenstücker, 1972,* Psallus pardalis *Seidenstücker, 1966,* Psallus salicis *(Kirschbaum, 1856), and* Psallus varians cornutus *Wagner, 1943. The first reliable record of* Lygus punctatus *(Zetterstedt, 1838) is also reported. 7 species are omitted from the list due to misidentifications in the past. The lectotype of* Dimorphocoris schmidti *(Fieber, 1858) is designated.*

Key words: Heteroptera, Cimicomorpha, Miridae, Slovenia, fauna

HETEROPTERA IN SLOVENIA, III: MIRIDAE

SINTESI

L'articolo presenta l'elenco di 260 specie di emitteri (Miridae) della Slovenia. Venti specie ed una sottospecie vengono segnalate per la prima volta: Dicyphus albonasutus *Wagner, 1951,* Dicyphus stachydis wagneri *Tamanini, 1956,* Deraeocoris flavilinea *(A. Costa, 1862),* Phytocoris austriacus *Wagner, 1954,* Polymerus microphthalmus *(Wagner, 1951),* Strongylocoris steganoides *(J. Sahlberg, 1875),* Globiceps novaki *Wagner, 1950,* Orthotylus rubidus *(Puton, 1874),* Orthotylus tenellus *(Fallén, 1807),* Hypseloecus visci *(Puton, 1888),* Europiella decolor *(Uhler, 1893),* Macrotylus atricapillus *(Scott, 1872),* Macrotylus paykullii *(Fallén, 1807),* Megalodactylus macularubra *(Mulsant & Rey, 1852),* Psallus wagneri *Ossiannilsson, 1953,* Psallus nigripilis *(Reuter, 1888),* Psallus anaemicus *Seidenstücker, 1966,* Psallus lentigo *Seidenstücker, 1972,* Psallus pardalis *Seidenstücker, 1966,* Psallus salicis *(Kirschbaum, 1856) e* Psallus varians cornutus *Wagner, 1943. Viene segnalato anche il primo ritrovamento accertato della* specie Lygus punctatus *(Zetterstedt, 1838). Sette specie sono state escluse dall'elenco in quanto non sono state determinate correttamente in passato. È stato invece determinato il lectotypus della specie* Dimorphocoris schmidti *(Fieber, 1858).*

Parole chiave: Heteroptera, Cimicomorpha, Miridae, Slovenia, fauna

INTRODUCTION

The family Miridae is the largest in the subordo Heteroptera. Mirids are mostly phytophagous, but many of them enrich their diet with animal food. Some (Deraeocorinae, Pilophorini) are even obligatory predators of aphids, scale insects and other small arthropods, their eggs and larvae. Some are used in biological pest control *(Macrolophus* spp.), while some others could be pests *(Lygus* spp., *Apolygus* spp.).

The study of Slovenian Miridae started with Scopoli (1763) who listed about 11 species (the identity of some is not clear). He is recognized as the author of 3 valid names of species: *Alloeonotus fulvipes, Heterocordylus genistae* and *Heterotoma merioptera*. In the distant past, the fauna around the town of Gorica (Gorizia) was discussed by Montandon (1886), Horváth (1887) and Reuter (1888), who described several new species, such as *Halticus henschii, Orthotylus palustris* and *Psallus henschii*. When the locality of Gorica is mentioned, however, we do not know whether the record refers to either Italy or Slovenia, considering that the present border runs through this town. Fieber (1836, 1858) described three species from the material collected in Slovenia by F.J. Schmidt: *Mermitelocerus schmidtii, Pachypterna fieberi* and *Dimorphocoris schmidti*. Two endemic species were described by Wagner (1965) – *Dimorphocoris saulii,* and by Gogala (2002) – *Platycranus boreae*.

The existing lists of species (Gogala & Gogala, 1986, 1989; Protić, 1998) are outdated and do not include neither a number of literature data nor exact localities. Several systematic revisions were published last years, so many genera required reexaminations and identifications of the museum specimens. The following list follows the nomenclature by Kerzhner & Josifov (1999) except for two changes: *Neolygus* is treated as a separate genus, and *Parapsallus* as a synonym of *Plagiognathus*. The list includes literature references for each species and exact data from the examined specimens, which are mostly kept in the Slovenian Museum of Natural History in Ljubljana (PMSL). A few additional records of specimens, collected by Czech collectors and determined by Petr Kment, are also published.

Additional photographs and maps of distribution of the Slovenian Heteroptera species are available online at the web address: http://www2.pms-lj.si/heteroptera/

LIST OF SPECIES

MIRIDAE

Isometopinae

Isometopus intrusus (Herrich-Schaeffer, 1835)
Fieber, 1861: Krain (= Kranjska, Carniola); Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 17. 7. 1984, 26. 8. 1984, 24. 7. 1988, 30. 6. 1992, 29. 6. 2001, on *Malus*, A. & M. Gogala leg.
Istra: Koštabona, Škrline, VL03, 21. 6. 2001, I. Sivec leg.

Bryocorinae

Bryocoris pteridis (Fallén, 1807)
Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 12. 8. 1981, 25. 8. 1982, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982 on *Pteridium*, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 5. 7. 1986 on *Dryopteris*, A. & M. Gogala leg.
Idrija, Krekovše, VL19, 28. 6. 1988, M. Gogala leg.

Monalocoris filicis (Linnaeus, 1758)
Gogala & Moder, 1960: Zg. Loke pri Blagovici; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 29. 5. 1977, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 24. 6. 1979 on *Dryopteris*, A. Gogala leg.
Ljubljana: Šiška, VM50, 3. 9. 1980, A. & M. Gogala leg.
Medvode, Jeprca, VM51, 22. 8. 1981, A. & M. Gogala leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Hrastnik, Podkraj, WM00, 30. 5. 1991, V. Furlan leg.
Gorjanci: Sv. Miklavž, WL27, 29. 8. 1990, V. Furlan leg.

Campyloneura virgula (Herrich-Schaeffer, 1835)
Gogala & Gogala, 1986
Specimens examined:
Ljubljana: Šiška, VM50, 22. 6. 1979, 3. 9. 1980, A. & M. Gogala leg.
Ljubljana, 27. 6. 1979, A. & M. Gogala leg.
Laško, Šmohor, WM11, 13. 7. 1984, A. & M. Gogala leg.
Vrhnika, Log, VL59, 15. 7. 1984, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 15. 7. 1990, 25. 6. 1997, A. & M. Gogala leg.
Podsreda, Trebča Gorca, WM40, 9. 7. 1998, S. Brelih leg.

Dicyphus albonasutus Wagner, 1951
Specimen examined:
Senovo, Reštanj, WL39, 1. 8. 1996, A. & M. Gogala leg.

Dicyphus geniculatus (Fieber, 1858)
Gogala & Moder, 1960 (confused with *D. globulifer);* Gogala & Gogala, 1986 (misidentification, records refer to *D. globulifer),* 1994
Specimens examined:
Istra: Osp, VL14, 8. 7. 1990, A. & M. Gogala leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.

Dicyphus globulifer (Fallén, 1829)
Gogala & Gogala, 1986, 1989
Specimens examined:

Medvode, Goričane, VM51, 15. 7. 1980, A. & M. Gogala leg.
Dobrova, VM50, 26. 8. 1981, A. & M. Gogala leg.
Ljubljana: Savlje, VM60, 18. 10. 1981, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 10. 7. 1988, A. & M. Gogala leg.
Sorica, Soriška planina, VM22, 23. 6. 1984, A. & M. Gogala leg.
Ljubljansko barje: Plešivica, VL59, 23. 4. 1978, A. & M. Gogala leg.
Istra: Koper, Škocjanski zatok, VL04, 1. 7. 1979, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Bevke, VL59, 11. 10. 1999, A. & M. Gogala leg.
Ig, Iška Loka, VL69, 17. 8. 1997, S. Brelih leg.
Mrzlica, 1100 m, WM01, 13. 6. 1991, V. Furlan leg.
Podsreda, Trebča Gorca, WM40, 9. 7. 1998, S. Brelih leg.
Ilirska Bistrica, Zarečje – Brce, VL34, 31. 5. 1999, S. Brelih leg.
Želimlje, VL68, 25. 4. 2003, S. Brelih leg.
Podkum, Medvedov graben, WM00, 25. 5. 1989, V. Furlan leg.
Postojna, VL37, 10. 6. 1991, V. Furlan leg.
Gornji Ig, VL68, 23. 5. 1987, V. Furlan leg.

Dicyphus constrictus (Boheman, 1852)
Gogala & Moder, 1960: Carniolia; Gogala & Gogala, 1986, 1989 (misidentification, records refer to *D. stachydis)*

Dicyphus epilobii Reuter, 1883
Gogala & Gogala, 1986, 1994
Specimens examined:
Podgorski kras: Petrinje, VL14, 8. 6. 1983, A. & M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 8. 9. 1983 on *Epilobium*, A. & M. Gogala leg.
Ajdovščina, VL18, 2. 8. 1985, A. & M. Gogala leg.
Podčetrtek, Vonarje, WM41, 6. 8. 1996, A. Gogala leg.
Istra: Movraž, Movraška vala, VL13, 5. 8. 1999, A. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 22. 7. 2000, A. Gogala leg.

Dicyphus errans (Wolff, 1804)
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Šklendrovec, WM00, 18. 9. 1932, Staudacher leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Kočevje, VL85, 6. – 14. 6. 1979, BIJH SAZU leg.
Ljubljansko barje: Log, Lukovica, VL59, 21. 9. 1980, 12. 9. 1987, A. & M. Gogala leg.
Bela krajina: Črnomelj, Rožanec, WL15, 13. 9. 1981, A. & M. Gogala leg.
Bela krajina: Vinica, Zilje, WL23, 13. 9. 1981, A. & M. Gogala leg.
Ravne na Koroškem, VM95, 30. 8. 1982, M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Istra: Osp, VL14, 8. 7. 1990, A. & M. Gogala leg.
Nanos: Šembijska bajta, VL27, 10. 8. 1996, A. & M. Gogala leg.

Dicyphus pallidus (Herrich-Schaeffer, 1836)
Gogala & Moder, 1960: Ljubljana, Tržič, Brežice, Šklendrovec; Gogala & Gogala, 1986, 1989
Specimens examined:
Neumarktl (= Tržič), VM43, 24. 9. 1925, Staudacher leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Prekmurje: Selo, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Uršlja gora: Poštarska koča, VM94, 22. 8. 1987, A. & M. Gogala leg.

Dicyphus stachydis J. Sahlberg, 1878
Dicyphus stachydis wagneri Tamanini, 1956
Specimens examined:
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Prekmurje: Petanjci, WM86, 29. 4. 1983, 24. 7. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Kum, WM00, 11. 9. 1997, A. & M. Gogala leg.

Macrolophus melanotoma (A. Costa, 1853)
Macrolophus caliginosus Wagner, 1951
Gogala & Gogala, 1986, 1989
Specimens examined:
Istra: Strunjan, UL94, 18. 5. 1980, 16. 10. 1985, A. & M. Gogala leg.
Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Portorož, Beli križ, UL84, 10. 10. 1984, M. Gogala leg.

Macrolophus pygmaeus (Rambur, 1839)
Macrolophus nubilus (Herrich-Schaeffer, 1835)
Gogala & Gogala, 1986
Specimens examined:
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, 29. 10. 1982, 10. 8. 1990, A. & M. Gogala leg.

Deraeocorinae

Alloeotomus germanicus Wagner, 1939
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kočevje, VL85, 6. – 14. 6. 1979, 1. – 15. 9. 1979, BIJH SAZU leg.
Istra: Črni kal, VL14, 7. 9. 1985, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 28. 9. 1996, A. & M. Gogala leg.
Vremščica, VL26, 18. 9. 2000, A. Kapla leg.
Ljubljana, VM60, 23. 8. 1982, V. Furlan leg.

Alloeotomus gothicus (Fallén, 1807)
Gogala & Gogala, 1986
Specimens examined:

Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983 on *Pinus*, A. & M. Gogala leg.
Velike Bloke, Ulaka, VL57, 7. 8. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Kokra, VM63, 14. 8. 1983, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 19. 8. 1984, A. & M. Gogala leg.

Deraeocoris serenus (Douglas & Scott, 1868)
Gogala & Moder, 1960: Črni kal; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Strunjan, UL94, 30. 9. 1979, A. & M. Gogala leg.
Koper, Škocjanski zatok, VL04, 1. 7. 1979, 18. 5. 1980, A. & M. Gogala leg.
Sečovlje, UL93, 20. 9. 1980, A. & M. Gogala leg.
Portorož, UL84, 15. 10. 1986, A. & M. Gogala leg.
Istra: Labor, VL03, 9. 9. 1987, A. Gogala leg.
Pomjan, VL03, 9. 6. 1990, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 3. 10. 1990, A. & M. Gogala leg.
Ankaran, VL04, 28. 10. 2000, A. & M. Gogala leg.

Deraeocoris annulipes (Herrich-Schaeffer, 1842)
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, Nemški rovt, VM22, 25. 7. 1979, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987 on *Larix*, A. & M. Gogala leg.

Deraeocoris flavilinea (A. Costa, 1862)
Specimens examined:
Kras: Brje pri Komnu, VL07, 25. 6. 1997 on *Prunus domestica*, 3. 6. 2001, A. Gogala leg.

Deraeocoris morio (Boheman, 1852)
Gogala & Gogala, 1986
Specimens examined:
Dolina Kolpe: Dol, WL03, 4. – 5. 6. 1979, BIJH SAZU leg.
Bela krajina: Damelj, WL13, 11. 7. 1974, M. Štangelj leg.

Deraeocoris olivaceus (Fabricius, 1777)
Eberstaller, 1864: Maribor; Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Vrhnika, VL49, 16. 6. 1982, C. Krušnik leg.
Ljubljansko barje: Log, Lukovica, VL59, 3. 7. 1986, A. & M. Gogala leg.
Kočevska Reka, 520 m, VL84, 4. 7. 1997, S. Brelih leg.

Deraeocoris ruber (Linnaeus, 1758)
Capsus laniarius (Linnaeus, 1767)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Brežice, Krka, Črni kal, Trenta: Pod Javorščkom; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Laibach (= Ljubljana), 29. 6. 1929, Staudacher leg.
Ljubljansko barje: Log, Lukovica, VL59, 27. 6. 1977, 1. 7. 1977, A. & M. Gogala leg.
Ig, Kremenica, VL68, 8. 7. 1976, S. Brelih leg.
Kras: Štorje, VL16, 22. 7. 1980, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Brkini: Slivje, VL24, 28. 7. 1984, A. & M. Gogala leg.
Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 5. 7. 1986, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 11. 7. 1986, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Brje pri Komnu, VL07, 18. 6. 1989, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 9. 6. 1990, A. & M. Gogala leg.
Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.
Istra: Hrvoji, VL03, 21. 7. 1997, S. Brelih leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.
Hodoš, Dolenci, XM09, 2. 8. 1998, S. Brelih leg.
Nanos: Šembijska bajta, 800 m, VL27, 14. 7. 1999, S. Brelih leg.
Bovec – Kanin, UM83, 18. 7. 2000, S. Brelih leg.
Bavšica, UM93, 22. 7. 2000, S. Brelih leg.
Bovec, Log čezsoški, UM82, 5. 7. 2001, S. Brelih leg.

Deraeocoris rutilus (Herrich-Schaeffer, 1838)
Reuter, 1888: Gorica; Gogala & Moder, 1960: Črni kal; Gogala & Gogala, 1986, 1994
Specimens examined:
Istra: Črni kal, VL14, 28. 6. 1980 on *Anthyllis*, 8. 6. 1983, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 9. 6. 1990, 14. 6. 1991, A. & M. Gogala leg., 12. 6. 1990, V. Furlan leg.
Istra: Podpeč, VL14, 22. 6. 1991, A. & M. Gogala leg.

Deraeocoris trifasciatus (Linnaeus, 1767)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Laibach (= Ljubljana), 1. 6. 1943, 15. 6. 1944, Staudacher leg.
Dol na Kolpi, WL03, 28. 8. – 16. 9. 1979, BIJH SAZU leg.
Istra: Črni kal, VL14, 7. 6. 1987, A. & M. Gogala leg.
Prekmurje: Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Benica, Murska šuma, XM15, 22. 5. 2001, A. Gogala leg.
Pokojišče, Padež, VL58, 9. 6. 2005 on *Corylus*, A. Gogala leg.
Ljubljana: Sostro, Zadvor, VL69, 6. 6. 1975, V. Furlan leg.

Deraeocoris lutescens (Schilling, 1837)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Brežice; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 11. 10. 1978, 21. 9. 1979, A. & M. Gogala leg.

Radovljica, VM33, 4. 3. 1979, A. & M. Gogala leg.
Vipavska dol.: Ozeljan, VL08, 7. 4. 1979, A. & M. Gogala leg.
Ljubljansko barje: Vnanje Gorice, VL59, 27. 8. 1980, A. & M. Gogala leg.
Planina, VL47, 19. 4. 1981, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Slavnik, VL14, 2. 6. 1984, A. & M. Gogala leg.
Vipava, Kodreti, VL17, 2. 8. 1985, A. & M. Gogala leg.
Istra: Labor, VL03, 9. 9. 1987, A. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 10. 9. 1988, A. & M. Gogala leg.
Koštabona, Supotski slap, VL03, 12. 10. 1988, A. & M. Gogala leg.
Kras: Lipica, VL15, 16. 5. 1992, A. & M. Gogala leg.
Padna, UL93, 1. 2. 1997, A. & M. Gogala leg.
Brje pri Komnu, VL07, 28. 5. 2000, A. Gogala leg.
Dragonja, Stena, UL93, 2. 4. 2005 on *Cupressus*, A. Gogala leg.
Cerkniško jezero: Zadnji kraj, VL56, 6. 6. 1997, S. Brelih leg.
Ljubljana: Šiška, VM60, 25. 10. 2000, S. Brelih leg.
Lendava, Dolga vas, XM16, 1. 11. 1999, S. Gomboc & D. Kofol leg.
Koper, Škocjanski zatok, VL04, 23. 4. 2002, S. Brelih leg.

Mirinae

Actinonotus pulcher (Herrich-Schaeffer, 1835)
Gogala & Moder, 1960: Kočevje; Gogala & Gogala, 1986, 1989; Floren & Gogala, 2002
Specimens examined:
Bärenheim (= Medvedjek, Goteniška gora), VL75, 29. 6. 1936, Staudacher leg.
Kočevski Rog: Stare žage, WL06, 15. 6. 1984, J. Carnelutti leg.
Kočevski Rog: Baza 20, WL06, 900 m, 26. 6. 1999, 28. 6. 1999, on *Abies alba*, A. Floren leg.
Trnovski gozd: Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.

Adelphocoris detritus (Fieber, 1861)
A. Gogala, 1996
Specimen examined:
Kranjska Gora, VM04, 700 m, 10. 7. 1986 on Fabaceae, H. Günther leg.

Adelphocoris lineolatus (Goeze, 1778)
Calocoris chenopodii (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Bohinj, Krka, Pokojišče, Brežice, Piran, Črni kal; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljansko barje: Podpeč, VL59, 12. 7. 1977, A. & M. Gogala leg.
Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Kras: Štanjel, VL17, 22. 7. 1980, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 16. 8. 1981, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 10. 8. 1981, A. & M. Gogala leg.
Ig, Kremenica, VL68, 16. 9. 1975, S. Brelih leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.
Prekmurje: Dobrovnik, XM06, 23. 7. 1983, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Goričko: Ocinje, WM78, 14. 6. 1987, A. & M. Gogala leg.
Labor, VL03, 9. 9. 1987, A. & M. Gogala leg.
Brje pri Komnu, VL07, 18. 6. 1989, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 9. 6. 1990, A. & M. Gogala leg.
Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 10. 6. 2000, A. Gogala leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.
Hrpelje, VL15, 24. 6. 1999, S. Brelih leg.
Sočerga, Šeki, VL13, 17. 6. 1999, S. Brelih leg.
N. Gorica, Panovec, UL98, 6. 7. 2000, S. Brelih leg.

Adelphocoris reichelii (Fieber, 1836)
Fieber, 1858: Krain (= Kranjska, Carniola), Schmidt leg; Fieber, 1861: Krain; Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986
Specimens examined:
Laibach (= Ljubljana), 1. 8. 1936, 8. 9. 1937, Staudacher leg.
Dobrova, VM50, 4. 8., A. Moder leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 31. 7. 1996, A. & M. Gogala leg.
Sp. Brnik, Nasovška gmajna, VM61, 8. 9. 2004, A. Gogala leg.

Adelphocoris seticornis (Fabricius, 1775)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Lancovo, Stara Fužina, Brežice, Krka; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 27. 6. 1977, A. & M. Gogala leg.
Celje, Griže, WM12, 20. 8. 1968, I. Sivec leg.
Vrhnika, Bistra, VL48, 18. 6. 1978, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Bovec, UM83, 17. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Iška loka, VL69, 10. 7. 1982, A. & M. Gogala leg.

Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Postojna, Zagon, VL37, 21. 9. 1983, A. & M. Gogala leg.
Osilnica, Plešce, slov. stran reke, VL74, 27. 7. 1985, A. & M. Gogala leg.
Horjul, Lesno brdo, VL49, 8. 6. 1986, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Sečovlje, UL93, 30. 8. 1989, A. & M. Gogala leg.
Sočerga, Mlini, VL13, 1. 8. 1990, A. & M. Gogala leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.
Ig, Iška Loka, VL69, 17. 8. 1997, S. Brelih leg.
Prekmurje: Sotina, WM78, 30. 7. 1998, S. Brelih leg.
Hrpelje, VL15, 24. 6. 1999, S. Brelih leg.
N. Gorica, Panovec, UL98, 24. 5. 2000, 6. 7. 2000, S. Brelih leg.

Adelphocoris ticinensis (Meyer-Dür, 1843)
Montandon, 1886: Gorica; Gogala & Moder, 1960; Gogala & Gogala, 1986, 1989; A. Gogala, 1992
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 26. 8. 1980, 16. 8. 1983, 22. 7. 1986, A. & M. Gogala leg.
Notranje Gorice, VL59, 8. 9. 1983, A. & M. Gogala leg.
Vipavska dolina: Ajdovščina, VL18, 2. 8. 1985, A. & M. Gogala leg.
Cerkniško jezero: Laze – Otok, VL56, 4. 8. 1991, A. & M. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 7. 8. 2001, A. Gogala leg.
Cerkniško jezero: Gorenje Jezero, VL56, 23. 8. 2002, A. Gogala leg.
Gradišče pri Lukovici, VM71, 31. 7. 1996, A. & M. Gogala leg.
Istra: Movraž, Movraška vala, VL13, 5. 8. 1999, A. & M. Gogala leg.
Rakov Škocjan, VL47, 20. 7. 2002, A. Gogala leg.
Bloke: Volčje, VL67, 19. 8. 2005, A. Gogala leg.

Adelphocoris vandalicus (Rossi, 1790)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana: Tomačevo, Verd; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Posavje, 10. 7. 1954, M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 17. 9. 1978, A. & M. Gogala leg.
Kras: Štanjel, VL17, 22. 7. 1980, A. & M. Gogala leg.
Kozina, VL15, 5. 8. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Brkini: Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Vipava, Braniška dol.: Kodreti, VL17, 2. 8. 1985, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 11. 7. 1986, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 2. 7. 1989, A. & M. Gogala leg.
Trstelj, UL98, 13. 8. 1989, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 1. 8. 1990, A. & M. Gogala leg., 12. 7. 1990, V. Furlan leg.
Ljubljana, Črnuče, VM60, 21. 6. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Hrpelje, Prešnica, VL14, 13. 7. 1998, S. Brelih leg.
Muljava, VL88, 24. 8. 1982, V. Furlan leg.
Povir, VL16, 31. 7. 1984, V. Furlan leg.

Agnocoris reclairei (Wagner, 1949)
Gogala & Moder, 1960: Ljubljana; A. Gogala, 1991
Specimen examined:
Laibach (= Ljubljana), 14. 7. 1929, Staudacher leg.

Agnocoris rubicundus (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Log; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana, Črnuče, VM60, 21. 6. 1982, A. & M. Gogala leg.
Dobrova, Gabrje, VM50, 5. 4. 1999, A. Gogala leg.
Ljubljana: Sostro, Zadvor, VL69, 30. 4. 1985, V. Furlan leg.

Alloeonotus egregius Fieber, 1864
Gogala & Moder, 1960: Trigl. jezera; Gogala & Gogala, 1986, 1989
Specimens examined:
Triglavska jezera, VM03, M. Gogala leg.
Julijske Alpe: Komna, VM02, 7. 7. 1983, A. & M. Gogala leg., 14. 8. 1982, V. Furlan leg.
Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.
Tosc, 1800 m, VM13, 6. 8. 1991, A. & M. Gogala leg.
Triglav, Vodnikova koča – Rudno polje, 1500 – 1800 m, VM13, 8. 8. 1991, E. Holzer leg.
Komna, Pl. za Migovcem, 1600 m, VM02, 1. 9. 1984, V. Furlan leg.

Alloeonotus fulvipes (Scopoli, 1763)
Cimex fulvipes Scopoli, 1763
Scopoli, 1763: Carniolia (western Slovenia – type locality); Reuter, 1888: Gorica; Gogala & Moder, 1960: Ljubljana, Divača, Slavnik; Gogala & Gogala, 1986, 1994
Specimens examined:
Borovnica, Pokojišče, VL58, 21. 7. 1929, Staudacher leg.
Bohinj: Ukanc, VM02, 3. 7. 1978, A. & M. Gogala leg.
Ig, Kurešček, VL68, 21. 6. 1980, A. & M. Gogala leg.
Janče, VM70, 7. 6. 1981, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 8. 6. 1983, A. & M. Gogala leg.
Kras: Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Ilirska Bistrica, Jelšane, VL43, 21. 6. 1983, M. Gogala leg.
Brje pri Komnu, VL07, 14. 5. 1989, A. & M. Gogala leg.
Istra: Sočerga, Veli Badin, VL13, 18. 5. 1990, A. & M. Gogala leg.
Ig, Škrilje, Stražar, 720 m, VL68, 9. 6. 1999, A. Gogala leg.
Ig, Kremenica, VL68, 23. 5. 1998, S. Brelih leg.
Senožeče, Gabrče, VL26, 20. 6. 1982, V. Furlan leg.

Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Podgorje, VL14, 28. 5. 1983, V. Furlan leg.
Brežec pri Podgorju, VL14, 16. 5. 1990, V. Furlan leg.
Topol, Sv. Katarina, VM50, 15. 6. 1997, V. Furlan leg.

Apolygus limbatus (Fallén, 1807)
Gogala & Moder, 1960; Gogala & Gogala, 1986, 1989
Specimens examined:
Cerknica, Begunje, Topol, VL57, 28. 6. 1981 on *Salix*, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Ljubljansko barje: Podpeč, VL59, 1. 8. 1984 on *Salix*, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Rakov Škocjan, VL47, 17. 6. 2005 on *Salix*, A. Gogala leg.

Apolygus lucorum (Meyer-Dür, 1843)
Gräffe, 1911: Logatec; Gogala & Gogala, 1986, 1989
Specimens examined:
Kočevje, VL85, 1. – 15. 9. 1979, BIJH SAZU leg.
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 3. 9. 1980, A. Gogala leg.
Bela krajina: Črnomelj, Rožanec, WL15, 13. 9. 1981, A. & M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Kokra, VM63, 14. 8. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Bohinj: Stara Fužina, Sv. Janez, VM12, 10. 7. 1985, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Istra: Movraž, Movraška vala, VL13, 5. 8. 1999, A. & M. Gogala leg.
Gradin, Koromači-Boškini, VL03, 5. 8. 1999, A. & M. Gogala leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.

Apolygus spinolae (Meyer-Dür, 1841)
Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Bevke, VL59, 26. 8. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Postojna, Landol, VL37, 21. 9. 1983, A. & M. Gogala leg.
Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 11. 7. 1996, A. Gogala leg.
Rakov Škocjan, VL47, 17. 8. 2001, A. Gogala leg.

Brachycoleus decolor Reuter, 1887
A. Gogala, 1996
Specimens examined:
Ilirska Bistrica, Štanga, VL44, 22. 7. 1992, A. & M. Gogala leg.
Nanos: Šembijska bajta, VL27, 25. 7. 1992 on Apiaceae, A. & M. Gogala leg.
Dragonja, Sv. Peter, UL93, 27. 5. 1999, S. Gomboc & D. Kofol leg.

Calocoris affinis (Herrich-Schaeffer, 1835)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Brinje (Črnuče), Bled, Bohinj, Planina na Kraju, Kočevje; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 26. 6. 1977, 9. 8. 1978, A. & M. Gogala leg.
Kras: Kopriva, VL07, 22. 7. 1980, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Železniki, Rudno, VM32, 15. 8. 1981, A. & M. Gogala leg.
Ig, Kremenica, VL68, 26. 6. 1976, S. Brelih leg.
Ljubljansko barje: Log, Lukovica, VL59, 23. 6. 1982, M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Rovte, Smrečje, VL39, 22. 7. 1985, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Uršlja gora: Poštarska koča, VM94, 22. 8. 1987, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Pohorje: Mala Kopa, WM15, 24. 9. 1999, M. Gogala leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Breginj, Bela, UM72, 9. 8. 2000, S. Brelih leg.
Julijske Alpe: Vas na skali, UM93, 21. 7. 2000, S. Brelih leg.
Kum, 1219 m, WM00, 20. 7. 1987, V. Furlan leg.
Ratitovec, 1500 m, VM22, 3. 8. 1985, V. Furlan leg.
Kamniška Bistrica, Stahovica, VM62, 4. 8. 1984, V. Furlan leg.
Povir, VL16, 31. 7. 1984, V. Furlan leg.
Postojna, VL37, 31. 7. 1984, V. Furlan leg.
Pliskovica, Podbreg, 180 m, VL07, 27. 6. 2001, S. Brelih leg.

Calocoris alpestris (Meyer-Dür, 1843)
Fieber, 1861: Krain; Gräffe, 1911: Logatec; Gogala & Moder, 1960: Trigl. jezera, Komarča, Rakek, Zaplata (Kamniško-Savinjske Alpe); Gogala & Gogala, 1986, 1989

Specimens examined:
Bärenheim (= Medvedjek, Goteniška gora), VL75, 29. 6. 1936, Staudacher leg.
Bohinj: Ukanc, VM02, 9. 7. 1978, A. & M. Gogala leg.
Ljubljansko barje: Bevke, VL59, 14. 6. 1980, A. & M. Gogala leg.
Rakitna, VL58, 22. 6. 1986, A. & M. Gogala leg.
Julijske Alpe: Komna, VM02, 7. 7. 1983, A. & M. Gogala leg.
Tosc, Jurjevčeva vrtača, 1500 – 1600 m, VM13, 8. 8. 1991, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Snežnik, Sviščaki, VL54, 11. 7. 1992, M. Gogala leg.
Trnovski gozd: Smrekova draga, VL19, 27. 6. 1998, A. Gogala leg.
Ig, Škrilje, Stražar, VL68, 15. 5. 2000, A. & M. Gogala leg.
Krim, Gornji Ig, VL68, 13. 6. 1981, V. Furlan leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Unec, VL47, 9. 6. 1983, V. Furlan leg.
Soriška planina, 1300 m, VM22, 24. 7. 1991, V. Furlan leg.

Calocoris roseomaculatus (De Geer, 1773)
Gogala & Moder, 1960: Divača, Slavnik
Calocoris roseomaculatus roseomaculatus (De Geer, 1773)
Gogala & Gogala, 1986
Specimen examined:
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Calocoris roseomaculatus angularis (Fieber, 1864)
Gogala & Gogala, 1986, 1994
Specimens examined:
Triglavska jezera, VM03, M. Gogala leg.
Borovnica, Pokojišče, VL48, 24. 6. 1977, 28. 6. 1978, A. & M. Gogala leg.
Bloke: Nova vas, VL67, 28. 6. 1981, A. & M. Gogala leg.
Kras: Senožeče, VL26, 28. 6. 1982, A. & M. Gogala leg.
Črni kal, VL14, 8. 6. 1983, A. & M. Gogala leg.
Brkini: Slivje, VL24, 28. 7. 1984, A. & M. Gogala leg.
Artviže, VL25, 28. 7. 1984, A. & M. Gogala leg.
Nanos: Sv. Hieronim – Pleša, VL27, 4. 7. 1998, A. & M. Gogala leg.
Obrov, Golac, VL24, 8. 6. 2000, S. Brelih leg.
Senožeče, Gabrče, VL26, 20. 6. 1982, V. Furlan leg.

Camptozygum aequale (Villers, 1789)
Camptozygum pinastri (Fallén, 1807)
Gogala & Moder, 1960; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 27. 6. 1979 on *Pinus*, A. Gogala leg.
Prekmurje: Selo, WM97, 5. 7. 1980, A. & M. Gogala leg.
Grosuplje, Polica, VL79, 27. 6. 1981 on *Pinus*, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, 11. 7. 1987, A. & M. Gogala leg.
Velike Bloke, Ulaka, VL57, 7. 8. 1983, A. & M. Gogala leg.
Ilirska Bistrica, Jelšane, VL43, 21. 6. 1983, M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 9. 8. 1984, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 19. 8. 1984, A. & M. Gogala leg.

Camptozygum pumilio Reuter, 1902
Gogala & Moder, 1960: Dolina Triglavskih jezer; Gogala & Gogala, 1989
Specimens examined:
Julijske Alpe: Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Pokljuka: Vel. Blejsko barje, VM23, 5. 8. 2003 on *Pinus mugo*, A. & M. Gogala leg.
Begunjščica, 1300 m, VM34, 10. 8. 1991, V. Furlan leg.
Grintovec, Češka koča, 1500 m, VM63, 18. 8. 1991, V. Furlan leg.

Capsodes gothicus (Linnaeus, 1758)
Scopoli, 1763; Gogala & Moder, 1960: Ljubljana, Slavnik; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Podpeč, VL59, 12. 7. 1977, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 23. 6. 1978, A. & M. Gogala leg.
Ig, Kremenica, VL68, 4. 7. 1976, S. Brelih leg.
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Iška loka, VL69, 10. 7. 1982, A. & M. Gogala leg.
Kras: Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Ljubljana: Savlje, VM60, 10. 6. 1983, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Rakitna, VL58, 22. 6. 1986, A. & M. Gogala leg.
Prekmurje: Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Goričko: Trdkova, WM89, 14. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Julijske Alpe: Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Istra: Zazid, Zalipnik, VL13, 26. 5. 2000, A. Gogala leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Bukovnica, XM07, 2. 6. 1999, S. Brelih leg.
Radeče, Jagnjenica, WM00, 24. 5. 1990, V. Furlan leg.
Trnovski gozd: Lokve, VL09, 27. 6. 1998, V. Furlan leg.

Capsodes mat (Rossi, 1790)
Fieber, 1861: Krain; Montandon, 1886: Gorica; Gräffe, 1911: Logatec; Gogala & Moder, 1960; Gogala & Gogala, 1986
Specimens examined:
Vrhnika, VL49, 16. 6. 1982, C. Krušnik leg.
Mala Polana, Črni log, XM06, 23. 5. 1992, A. & M. Gogala leg.
Prekmurje: Dol. Bistrica, XM05, 23. 5. 1992, A. & M. Co-

gala leg.
Medvode, Sp. Pirniče, VM51, 8. 6. 1995, A. Gogala leg.
Ljubljansko barje: Ig, Draga, VL68, 13. 7. 1999, A. & M. Gogala leg.
Rakov Škocjan, VL47, 17. 6. 2005 on *Corylus*, A. Gogala leg.
Cerkniško jezero: Zadnji kraj, VL56, 6. 6. 1997, S. Brelih leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.

Capsus ater (Linnaeus, 1758)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Ig; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljansko barje: Bevke, VL59, 25. 5. 1977, 14. 6. 1980, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 3. 7. 1978, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Ljubljana: Savlje, VM60, 10. 6. 1983, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Istra: Koštabona, VL03, 7. 6. 1987, A. & M. Gogala leg.
Prekmurje: Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Sečovlje, Fontanigge, UL93, 6. 5. 2000, A. Gogala leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Ilirska Bistrica, Zarečje – Brce, VL34, 31. 5. 1999, S. Brelih leg.
N. Gorica, Panovec, UL98, 24. 5. 2000, S. Brelih leg.
Karavanke: Košutnik, VM54, 20. 6. 2000, S. Brelih leg.
Koper, Škocjanski zatok, VL04, 23. 5. 2000, S. Brelih leg.
Sočerga, Veli Badin, VL13, 16. 5. 1990, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Kum, 1219 m, WM00, 20. 7. 1987, V. Furlan leg.

Charagochilus gyllenhalii (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Brežice, Log v Trenti; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Kras: Štanjel, VL17, 22. 7. 1980, A. & M. Gogala leg.
Vrhnika, Log, VL59, 7. 3. 1981, A. & M. Gogala leg.
Koštabona, VL03, 25. 6. 1981, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, 11. 7. 1987, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Istra: Labor, VL03, 9. 9. 1987, A. Gogala leg.
Črni kal, VL14, 17. 2. 1988, A. & M. Gogala leg.
Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Logarska dolina, VM74, 25. 6. 1988, A. & M. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 10. 9. 1988, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 18. 5. 1990, A. & M. Gogala leg.
Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.
Slov. Gorice: Hlaponci, WM74, 23. 4. 1998, S. Brelih leg.
Murski Petrovci, WM87, 1. 8. 1998, S. Brelih leg.
Podsreda, Loke, WM40, 9. 7. 1998, S. Brelih leg.
Bovec, Kluže – Koritnica, UM93, 21. 8. 1996, B. Drovenik leg.
Trnovski gozd: Nemci, VL09, 30. 6. 1996, S. Brelih leg.
Podsreda, Trebča Gorca, WM40, 18. 5. 2000, S. Brelih leg.

Charagochilus weberi Wagner, 1953
Gogala & Gogala, 1986, 1989
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Rakitna, VL58, 28. 6. 1981, A. & M. Gogala leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 25. 8. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Istra: Labor, VL03, 9. 9. 1987, A. Gogala leg.
Ig, Iška Loka, VL69, 17. 8. 1997, S. Brelih leg.
Bovec – Kanin, UM83, 23. 7. 2000, S. Brelih leg.

Closterotomus annulus (Brullé, 1832)
Calocoris fuscescens Reuter, 1877
Gogala & Gogala, 1986, 1994
Specimens examined:
Istra: Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 18. 5. 1990, 9. 6. 1990, 20. 5. 2001, A. & M. Gogala leg.
Topolovec, VL03, 9. 5. 1991, A. & M. Gogala leg.
Strunjan, UL94, 12. 5. 1998, A. & M. Gogala leg.
Movraž, Kuk, VL13, 14. 5. 2000, A. Gogala leg.
Sočerga, Šeki, VL13, 14. 6. 1999, 17. 6. 1999, S. Brelih leg.

Closterotomus biclavatus (Herrich-Schaeffer, 1835)
Gogala & Moder, 1960: Ljubljana, Utik, Dobrova, Trigl. jezera, Bohinj, Kofce; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 19. 6. 1977, A. & M. Gogala leg.
Ljubljana: Šentvid, VM50, 22. 6. 1980, A. & M. Gogala leg.
Grosuplje, Polica, VL79, 27. 6. 1981, A. & M. Gogala leg.
Slavnik, VL14, 28. 6. 1982, M. Gogala leg.
Kras: Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, 11. 7. 1987, A. & M. Gogala leg.

Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Istra: Padna, UL93, 16. 6. 1984, A. & M. Gogala leg.
Brkini: Artviže, VL25, 28. 7. 1984, A. & M. Gogala leg.
Horjul, Lesno brdo, VL49, 8. 6. 1986, A. & M. Gogala leg.
Prekmurje: Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Pohorje: Lovrenška jezera, WM24, 23. 8. 1987, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Triglav, Vodnikova koča – Rudno polje, 1500 – 1800 m, VM13, 8. 8. 1991, E. Holzer leg.
Komen, Branik, VL07, 27. 5. 1998, S. Brelih leg.
Ig, Kremenica, VL68, 23. 5. 1998, S. Brelih leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Ilirska Bistrica, Zarečje – Brce, VL34, 31. 5. 1999, S. Brelih leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Grintovec, Češka koča, 1500 m, VM63, 18. 8. 1991, V. Furlan leg.
Zg. Radovna, Kot, 980 m, VM14, 22. 7. 1988, V. Furlan leg.
Zg. Tuhinj, Menina planina, VM82, 7. 7. 1989, V. Furlan leg.

Closterotomus fulvomaculatus (De Geer, 1773)
Gogala & Gogala, 1986
Specimens examined:
Ljubljana: Šiška, VM50, 24. 6. 1981, A. Gogala leg.
Ig, Draga, VL68, 26. 6. 1976, S. Brelih leg.
Cerknica, Begunje, Topol, VL57, 28. 6. 1981, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Rakov Škocjan, VL47, 6. 6. 1998, 17. 6. 2005 on *Salix*, A. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.
Ig, Iška, VL68, 10. 6. 2005, A. Gogala leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.

Closterotomus norwegicus (Gmelin, 1790)
Calocoris bipunctatus (Fabricius, 1779)
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 24. 6. 1979, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Istra: Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Brkini: Artviže, VL25, 28. 7. 1984, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Planina, Planinsko polje, VL47, 8. 7. 1999, A. Gogala leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ljubljana, Golovec, VL69, 18. 6. 1982, V. Furlan leg.

Closterotomus ventralis (Reuter, 1879)
A. Gogala, 1996
Specimen examined:
Kras: Brje pri Komnu, VL07, 8. 7. 1995 on *Clematis*, A. Gogala leg.

Cyphodema instabilis (Lucas, 1849)
Gogala & Gogala, 1986
Specimen examined:
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.

Dichrooscytus intermedius Reuter, 1885
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 26. 6. 1977, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 22. 6. 1979, A. Gogala leg.
Laško, Šmohor, WM11, 13. 7. 1984 on *Picea*, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 9. 8. 1984, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 19. 8. 1984, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Polhograjsko hrib.: Topol, Grmada, VM40, 19. 6. 1993, A. & M. Gogala leg.
Idrija, Godovič, VL29, 17. 6. 2000, A. & M. Gogala leg.

Dichrooscytus rufipennis (Fallén, 1807)
Gogala & Gogala, 1989
Specimens examined:
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987 on *Pinus*, A. & M. Gogala leg.

Dionconotus confluens Hoberlandt, 1945
Dionconotus neglectus (Herrich-Schaeffer, 1836)
Gogala & Gogala, 1986, 1989
Specimens examined:
Planinsko polje: Laze, VL47, 30. 5. 1980, A. & M. Gogala leg.
Slavnik, VL14, 31. 5. 1981, 2. 6. 1984, 23. 6. 1991, A. & M. Gogala leg.
Kras: Škocjan, VL25, 27. 6. 1981, A. & M. Gogala leg.
Prekmurje: Petanjci, WM86, 29. 4. 1983, A. & M. Gogala leg.
Planina, VL47, 21. 5. 1983, A. & M. Gogala leg.
Prekmurje: Dolnja Bistrica, XM05, 23. 5. 1992, A. & M. Gogala leg.

Sp. Branica, Čipnje, VL07, 23. 5. 1993, A. & M. Gogala leg.
Lendava, Dolina, XM15, 22. 5. 2001, A. & M. Gogala leg.
Vremščica, VL26, 30. 5. 1982, V. Furlan leg.
Kras: Lipica, VL15, 30. 5. 1982, V. Furlan leg.
Bela krajina: Metlika, Primostek, WL25, 28. 4. 1983, V. Furlan leg.
Ig, Iški Vintgar, VL68, 13. 5. 1989, V. Furlan leg.
Brežice, Terme Čatež, WL48, 25. 4. 1998, V. Furlan leg.

Grypocoris sexguttatus (Fabricius, 1777)
Gogala & Moder, 1960: Trigl. jezera; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Rakitna, VL58, 22. 6. 1986, A. & M. Gogala leg.
Tosc, Jurjevčeva vrtača, 1500 – 1600 m, VM13, 8. 8. 1991, A. & M. Gogala leg.
Triglav, Vodnikova koča – Rudno polje, 1500 – 1800 m, VM13, 8. 8. 1991, E. Holzer leg.
Snežnik, Sviščaki, VL54, 11. 7. 1992, M. Gogala leg.
Mokrec, VL68, 1. 7. 1976, V. Furlan leg.
Jezersko: Planšarsko jezero, VM64, 11. 7. 1976, V. Furlan leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Triglavska jezera, 1685 m, VM03, 2. 9. 1984, V. Furlan leg.
Soriška planina, 1300 m, VM22, 24. 7. 1991, V. Furlan leg.
Mrzlica, Preval Vrhe, WM01, 25. 6. 1991, V. Furlan leg.
Additional record: Kamniško-Savinjske Alpe: Logarska dolina, 700 – 1100 m, VM74, 21. – 24. 6. 2005, J. Kolibáč leg., P. Kment det.

Liocoris tripustulatus (Fabricius, 1781)
Eberstaller, 1864: Maribor; Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Otoče, Sevnica, Fiesa; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Piran, UL84, 15. 4. 1979, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 27. 4. 1983, A. & M. Gogala leg.
Istra: Osp, VL14, 8. 7. 1990, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 23. 10. 2004 on *Micromeria*, A. Gogala leg.
Murski Petrovci, WM87, 6. 8. 1998, S. Brelih leg.
Radovna, VM24, 14. 5. 1983, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ratitovec, Prtovč, VM22, 10. 6. 1984, V. Furlan leg.
Kum, 1216 m, WM00, 4. 6. 1988, V. Furlan leg.
Polhograjsko hrib.: Grmada, VM40, 9. 5. 1987, V. Furlan leg.
Borovak pri Podkumu, WM00, 9. 5. 1990, V. Furlan leg.
Mrzlica, Preval Vrhe, WM01, 28. 5. 1991, V. Furlan leg.
Gornji Ig, VL68, 14. 5. 1991, V. Furlan leg.
Ljubljansko barje: Lavrica, VL69, 23. 4. 1991, V. Furlan leg.
Kočevski Rog: Luža, 800 m, VL96, 18. 7. 2001, S. Brelih leg.

Lygocoris pabulinus (Linnaeus, 1761)
Scopoli, 1763; Gogala & Moder, 1960: Ljubljana, Bohinj, Trigl. jezera, Kot (Mojstrana); Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Borovnica, VL58, 23. 6. 1979, A. & M. Gogala leg.
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 19. 8. 1981, A. Gogala leg.
Dobrova, VM50, 26. 8. 1981, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 12. 8. 1981, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Uršlja gora: Poštarska koča, VM94, 22. 8. 1987, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 4. 10. 1987, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 12. 6. 1996, A. & M. Gogala leg.
Cerknica, Dolenja vas, VL47, 21. 8. 1997, S. Brelih leg.
Radenci, Hrastje-Mota, WM86, 7. 8. 1998, S. Brelih leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.

Lygocoris rugicollis (Fallén, 1807)
Gogala & Gogala, 1986, 1989
Specimens examined:
Dol na Kolpi, WL03, 1. – 5. 6. 1979, BIJH SAZU leg.
Solčava, Matkov kot, VM74, 26. 6. 1988 on *Salix*, A. & M. Gogala leg.

Lygus pratensis (Linnaeus, 1758)
? *Cimex umbellatarum* Scopoli, 1763
Scopoli, 1763; Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Bela krajina: Črnomelj, Rožanec, WL15, 13. 9. 1981, A. & M. Gogala leg.
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Ljubljansko barje: Bevke, VL59, 14. 6. 1980, A. & M. Gogala leg.
Dragomer, VL59, 25. 7. 1980, A. & M. Gogala leg.
Sečovlje, UL93, 20. 9. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 4. 10. 1981, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Strunjan, UL94, 16. 10. 1985, A. & M. Gogala leg.
Trnovski gozd: Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 10. 9. 1988, A. & M. Gogala leg.
Istra: Bezovica, VL14, 3. 10. 1990, A. & M. Gogala leg.
Portorož, Lucija, UL94, 2. 7. 1983, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 7. 7. 2000, A. Gogala leg.

Rakov Škocjan, VL47, 20. 7. 2002, A. Gogala leg.
Dragonja, Stena, UL93, 2. 4. 2005, A. Gogala leg.
Murski Petrovci, WM87, 1. 8. 1998, S. Brelih leg.
N. Gorica, Panovec, UL98, 6. 7. 2000, 10. 5. 2001, S. Brelih leg.
Podsreda, Trebča Gorca, WM40, 18. 5. 2000, S. Brelih leg.
Col, Črni vrh, VL28, 21. 4. 1979, V. Furlan leg.
Bela krajina: Vinica, WL13, 29. 4. 1983, V. Furlan leg.
Suha krajina: Žvirče, VL87, 7. 5. 1983, V. Furlan leg.
Ljubljana, Golovec, VL69, 11. 5. 1982, V. Furlan leg.
Ljubljana: Rožnik, VM50, 23. 4. 1983, V. Furlan leg.

Lygus punctatus (Zetterstedt, 1838)
Lygus rutilans Horváth, 1888
Gogala & Moder, 1960 (probably confused with *L. wagneri);* Gogala & Gogala, 1986, 1989 (misidentification – records refer to *L. wagneri)*
Specimen examined:
Mangart: Mangartsko sedlo, UM94, 2. 7. 1993, A. & M. Gogala leg.

Lygus rugulipennis Poppius, 1911
Lygus campestris auct. (non Linnaeus, 1758)
Lygus pubescens Reuter, 1912
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Črnuče, Kamn. Bistrica, Bohinj; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana, Sostro, VL79, 21. 4. 1979, A. & M. Gogala leg.
Polzela, Žovnek, WM02, 10. 8. 1968, M. Žolnir leg.
Celje, Griže, WM12, 20. 8. 1968, I. Sivec leg.
Celje, WM22, 13. 8. 1968, I. Sivec leg.
Log, Lukovica, VL59, 22. 6. 1979, A. & M. Gogala leg.
Ljubljansko barje: Plešivica, VL59, 9. 3. 1980, A. & M. Gogala leg.
Turjak, VL78, 25. 5. 1980, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Medvode, Jeprca, VM51, 22. 8. 1981, A. & M. Gogala leg.
Goričko: Gornji Petrovci, WM98, 1. 5. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Prekmurje: Dobrovnik, XM06, 23. 7. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 10. 9. 1988, A. & M. Gogala leg.
Sp. Brnik, VM61, 7. 9. 1988, A. & M. Gogala leg.
Murski Petrovci, WM87, 1. 8. 1998, S. Brelih leg.
Bukovnica, XM07, 1. 8. 1998, S. Brelih leg.
Radenci, Hrastje-Mota, WM86, 7. 8. 1998, S. Brelih leg.
Gančani, WM96, 18. 6. 1992, S. Gomboc & D. Kofol leg.
Julijske Alpe: Krma, VM13, 14. 5. 1983, V. Furlan leg.
Muljava, VL88, 7. 5. 1983, V. Furlan leg.
Bela krajina: Podzemelj, WL25, 28. 4. 1983, V. Furlan leg.
Škofja Loka, Praprotno, VM41, 24. 4. 1983, V. Furlan leg.
Ljubljana, Golovec, Orle, VL69, 18. 3. 1998, V. Furlan leg.

Lygus wagneri Remane, 1955
A. Gogala, 1991
Specimens examined:
Bohinj: Ukanc, VM02, 9. 7. 1978, A. & M. Gogala leg.
Julijske Alpe: Pl. Dedno polje, VM03, 20. 7. 1980, A. & M. Gogala leg.
Kamniško-Savinjske Alpe: Krvavec, VM62, 14. 6. 1981, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Postojna, Zagon, VL37, 21. 9. 1983, A. & M. Gogala leg.
Sorica, Soriška planina, VM22, 23. 6. 1984, A. & M. Gogala leg.
Velike Bloke, VL57, 19. 4. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Triglav, Rudno polje – Planika, 1500 – 2400 m, VM13, 5. 8. 1991, E. Holzer leg.
Mangart: Mangartsko sedlo, UM94, 2. 7. 1993, A. & M. Gogala leg.
Snežnik, VL54, 22. 7. 1992, A. & M. Gogala leg.
Kum, WM00, 26. 7. 1996, A. & M. Gogala leg., 23. 7. 1997, A. Kapla leg.
Rombon – Pl. Goričica, UM83, 9. – 11. 6. 2000, A. Kapla leg.
Rakov Škocjan, VL47, 20. 7. 2002, A. Gogala leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Ratitovec, 1100 m, VM22, 6. 6. 1982, V. Furlan leg.
Gorjanci: Jugorje, WL16, 27. 4. 1983, V. Furlan leg.
Suha krajina: Ambrus, VL87, 7. 5. 1983, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Julijske Alpe: Krma, VM13, 14. 5. 1983, V. Furlan leg.

Megacoelum beckeri (Fieber, 1870)
Gogala & Moder, 1960; Gogala & Gogala, 1986
Specimens examined:
Dol na Kolpi, WL03, 25. 9. – 12. 10. 1979, BIJH SAZU leg.
Kras: Brje pri Komnu, VL07, 7. 9. 1989, 3. 6. 2001, A. & M. Gogala leg.

Megacoelum infusum (Herrich-Schaeffer, 1837)
Horváth, 1887: Gorica; Gogala & Moder, 1960

Mermitelocerus schmidtii (Fieber, 1836)
Capsus bimaculatus Herrich-Schaeffer, 1835
Phytocoris schmidtii Fieber, 1836
Fieber, 1836: Illyrien, Krain (syntypes); Fieber, 1861: Krain; Gogala & Moder, 1960: Ljubljana, Ig, Log; Gogala & Gogala, 1986, 1989
Specimens examined:
Carniola, F. Schmidt leg.
Studenec – Ig, VL69, 17. 6. 1928, Staudacher leg.
Ljubljana, 16. 6. 1954, M. Gogala leg.
Ljubljana: Šiška, VM50, 25. 5. 1977, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Ig, Kremenica, VL68, 24. 5. 1981, A. & M. Gogala leg.

Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 1. 6. 2000, A. & M. Gogala leg.
Prekmurje: Benica, Murska šuma, XM15, 22. 5. 2001, A. Gogala leg.
N. Gorica, Panovec, UL98, 15. 5. 2000, S. Brelih leg.
Ljubljana, Golovec, VL69, 18. 6. 1982, V. Furlan leg.
Ljubljana, Golovec, Orle, VL69, 2. 6. 1984, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ratitovec, Prtovč, VM22, 10. 6. 1984, V. Furlan leg.

Miridius pallidus Horváth, 1887
A. Gogala, 1991
Specimen examined:
Kras: Brje pri Komnu, VL07, 16. 6. 1990, A. Gogala leg.

Miris striatus (Linnaeus, 1758)
Scopoli, 1763; Gogala & Moder, 1960: Ljubljana, Planina pod skalo, Log v Trenti; Gogala & Gogala, 1986, 1989
Specimens examined:
Laibach (= Ljubljana), 12. 8. 1938, Staudacher leg.
Planinsko polje: Laze, VL47, 11. 6. 1982 on *Rhamnus*, A. & M. Gogala leg.
Solčava, Žibovt – Kisla voda, VM74, 26. 6. 1988, A. & M. Gogala leg.
Triglav: Planika, 2400 m, VM13, 6. 8. 1991, A. & M. Gogala leg.
Snežnik, VL54, 22. 7. 1992, A. & M. Gogala leg.
Hrastnik, Krnice, WM00, 26. 5. 1997, M. Gogala leg.
Pokojišče, Zavrh, VL48, 9. 6. 2005 on *Crataegus*, A. Gogala leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.
Obrov, Golac, VL24, 10. 6. 1999, S. Brelih leg.
Hrpelje, Prešnica, VL14, 23. 5. 1999, S. Brelih leg.
Slavnik, VL14, 9. 6. 1979, V. Furlan leg.
Polhov Gradec, Grmada, VM40, 15. 6. 1980, V. Furlan leg.
Gornji Ig, 600 m, VL68, 5. 6. 1982, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ljubljana, Golovec, Orle, VL69, 2. 6. 1984, V. Furlan leg.
Topol, Osredek, VM50, 3. 6. 1984, V. Furlan leg.

Neolygus contaminatus (Fallén, 1807)
Gogala & Gogala, 1989
Specimens examined:
Ljubljana: Žale, VM60, 4. 7. 1987 on *Betula*, M. Gogala leg.

Neolygus viridis (Fallén, 1807)
Gogala & Gogala, 1986, 1989
Specimens examined:
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Ljubljana, VM60, 20. 6. 1984, V. Furlan leg.

Orthops montanus (Schilling, 1837)
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Kamniško-Savinjske Alpe: Okrešelj, VM63, 25. 6. 1988, A. & M. Gogala leg.
Krvavec, Dolge njive, VM63, 29. 7. 1992, A. & M. Gogala leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Julijske Alpe: Krma, VM13, 14. 5. 1983, V. Furlan leg.

Orthops basalis (A. Costa, 1853)
Gogala & Gogala, 1986
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 8. 4. 1979, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.

Orthops kalmii (Linnaeus, 1758)
Montandon, 1886: Gorica; Gogala & Moder, 1960 (confused with *O. basalis);* Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Strunjan, UL94, 16. 10. 1985, A. & M. Gogala leg.
Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Istra: Bezovica, VL14, 3. 10. 1990, A. & M. Gogala leg.
Vremščica, VL26, 2. 11. 1996, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 14. 11. 1998, A. Gogala leg.

Pachypterna fieberi Fieber, 1858 (Fig. 1)
Fieber, 1858: Krainer Alpen (Carniolan Alps: type locality), Schmidt leg.; Fieber, 1861; Gogala & Moder, 1960: Carniolia, Schmidt leg.; Gogala & Gogala, 1986; A. Gogala, 1992; Kerzhner & Matocq, 1994: designation of the lectotype
Specimens examined:
Carniola, F. J. Schmidt leg.
Dolina Triglavskih jezer: Dvojno jezero (pri koči), VM03, 6. 7. 1983 on *Pinus mugo*, A. & M. Gogala leg.

Note: Type material of this species, like of some others, was collected by F. J. Schmidt, who chose its name and sent it to Fieber. Fieber mentioned Schmidt as author of the name *Phytocoris fieberi*, *in litteris*, in the description. Ferdinand J. Schmidt was a well known entomologist from Ljubljana (now Slovenian, then Carniolan capital). His collection containing also two specimens of *P. fieberi* is preserved in the Slovenian Museum of Natural History.

Pantilius tunicatus (Fabricius, 1781)
Gogala & Moder, 1960: Ljubljana, Bohinj, Lubnik; Gogala & Gogala, 1986
Specimens examined:
Ljubljana, VM60, 17. 8. 1979, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 4. 11. 1979, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.

Fig. 1: *Pachypterna fieberi* ***Fieber, male from Triglav Lakes (Julian Alps).***
Sl. 1: *Pachypterna fieberi* ***Fieber, samec s Triglavskih jezer (Julijske Alpe).***

Postojna, Zagon, VL37, 21. 9. 1983, A. & M. Gogala leg.
Vrhnika, Zaplana, VL49, 17. 9. 1985 on *Corylus*, A. & M. Gogala leg.
Ajdovščina, Gaberje, VL17, 27. 9. 2000, S. Gomboc & D. Kofol leg.
Loški potok: Retje, VL66, 11. 9. 1982, V. Furlan leg.

Phytocoris parvulus Reuter, 1880
Gogala & Gogala, 1986, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 1. 7. 1979, A. & M. Gogala leg.
Brkini: Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Istra: Sočerga, Veli Badin, VL13, 3. 10. 1990, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 14. 7. 1999, A. & M. Gogala leg.

Phytocoris austriacus Wagner, 1954
Specimens examined:
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Kras: Trstelj, UL98, 13. 8. 1989, 19. 8. 1990, A. & M. Gogala leg.
Trnovski gozd: Otlica, Otliški maj, VL18, 14. 7. 2001, A. Gogala leg.
Kras: Lukovec, Golec, VL07, 6. 8. 2005, A. Gogala leg.

Phytocoris ulmi (Linnaeus, 1758)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Pokojišče; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 27. 6. 1979, A. Gogala leg.
Bohinj: Ukanc, VM02, 24. 7. 1979, A. & M. Gogala leg.
Kras: Hrpelje, VL15, 2. 7. 1982, A. & M. Gogala leg.
Istra: Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Brkini: Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 9. 8. 1984, A. & M. Gogala leg.
Rovte, Smrečje, VL39, 22. 7. 1985, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Brje pri Komnu, VL07, 26. 6. 1993, M. Gogala leg.
Hrpelje, VL15, 24. 6. 1999, S. Brelih leg.

Phytocoris varipes Boheman, 1852
Montandon, 1886: Gorica; Kormilev, 1929: Gorica; Gogala & Gogala, 1986 (confused with *Ph. austriacus*), 1994
Specimens examined:
Sečovlje, UL93, 20. 9. 1980, A. & M. Gogala leg.
Istra: Marezige, VL04, 7. 9. 1985, A. Gogala leg.
Sočerga, Veli Badin, VL13, 3. 10. 1990, A. & M. Gogala leg.
Braniška dol.: Sp. Branica, Čipnje, VL07, 18. 7. 1991, A. & M. Gogala leg.
Kraški rob: Zazid, Lipnik, VL13, 7. 7. 2001, A. & M. Gogala leg.

Phytocoris ustulatus Herrich-Schaeffer, 1835
Montandon, 1886: Gorica; Gogala & Moder, 1960: Črni kal; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 30. 6. 1979, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 11. 7. 1986, A. & M. Gogala leg.
Zazid, Lipnik, VL13, 2. 8. 2001, A. Gogala leg.
Podgorje, Golič, VL13, 13. 8. 2002, A. Gogala leg.

Phytocoris dimidiatus Kirschbaum, 1856
Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.

Phytocoris hirsutulus Flor, 1861
Floren & Gogala, 2002
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.

Kočevski Rog, Baza 20, 900 m, WL06, 25. 6. 1999, 28. 6. 1999, on *Fagus sylvatica*, A. Floren leg.

Phytocoris longipennis Flor, 1861
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 23. 8. 1980, 31. 7. 1983 on *Corylus*, A. & M. Gogala leg.
Ljubljansko barje: Podpeč, VL59, 6. 8. 1983, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.

Phytocoris pini Kirschbaum, 1856
Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Bohinjska Bistrica, Nemški rovt, VM22, 25. 7. 1979, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Muljava, VL88, 24. 8. 1982, V. Furlan leg.

Phytocoris populi (Linnaeus, 1758)
Gogala & Moder, 1960: Pokojišče; Gogala & Gogala, 1986
Specimen examined:
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.

Phytocoris reuteri Saunders, 1876
Gogala & Gogala, 1986
Specimens examined:
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Krško, Anovec, WL49, 1. 8. 1996, A. & M. Gogala leg.
Hrastnik, WM01, 9. 1997, A. Kapla leg.

Phytocoris tiliae (Fabricius, 1777)
Gogala & Gogala, 1986
Specimen examined:
Dol na Kolpi, WL03, 28. 8. – 16. 9. 1979, BIJH SAZU leg.

Phytocoris meridionalis Herrich-Schaeffer, 1835
Phytocoris signoreti Perris, 1857
Reuter, 1888: Gorica
Specimen examined:
Hrastnik, WM01, 9. 1997, A. Kapla leg.

Pinalitus atomarius (Meyer-Dür, 1843)
Floren & Gogala, 2002
Specimens examined:
Kočevski Rog, Baza 20, 900 m, WL06, 25. 6. 1999, 26. 6. 1999, on *Abies alba,* A. Floren leg.

Pinalitus cervinus (Herrich-Schaeffer, 1841)
Reuter, 1888: Gorica; Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Bohinjska Bistrica, Nemški rovt, VM22, 15. 8. 1981, A. & M. Gogala leg.

Pinalitus rubricatus (Fallén, 1807)
Gräffe, 1911: Logatec; Gogala & Moder, 1960: Bohinj; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 22. 6. 1979 on *Picea*, A. Gogala leg.
Bohinj: Ukanc, VM02, 24. 7. 1979, A. & M. Gogala leg.
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Grosuplje, Polica, VL79, 27. 6. 1981 on *Picea*, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981 on *Picea*, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Bohinj: Ribčev laz, Sv. Janez, VM12, 10. 7. 1985, A. & M. Gogala leg.
Pohorje: Lovrenc, Jezerska jama (Ribnik), WM24, 23. 8. 1987, A. & M. Gogala leg.
Pokljuka: Vel. Blejsko barje, VM23, 5. 8. 2003, A. & M. Gogala leg.

Pinalitus viscicola (Puton, 1888)
Floren & Gogala, 2002
Specimens examined:
Krško, Anovec, WL49, 1. 8. 1996, A. & M. Gogala leg.
Stara vas – Bizeljsko, WL59, 6. 8. 1996, A. & M. Gogala leg.
Kočevski Rog, Baza 20, 900 m, WL06, 28. 6. 1999, A. Floren leg.

Polymerus asperulae (Fieber, 1861)
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Kras: Senožeče, VL26, 28. 6. 1982, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 8. 6. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Štanjel, Kopriva, VL07, 2. 8. 1985, A. & M. Gogala leg.
Trnovski gozd: Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Brje pri Komnu, VL07, 7. 9. 1989, A. & M. Gogala leg.
Vremščica, VL26, 18. 9. 2000, 23. 6. 2005, A. Gogala leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.

Polymerus brevicornis (Reuter, 1879)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1994 (misidentification of a weakly pigmented specimen of *P. asperulae)*

Polymerus cognatus (Fieber, 1858)
Gogala & Gogala, 1986
Specimen examined:
Istra: Portorož, UL84, 9. 7. 1980, A. & M. Gogala leg.

Polymerus microphthalmus (Wagner, 1951)
Specimens examined:
Bovec, UM83, 17. 7. 1982, A. & M. Gogala leg.
Loški potok, VL66, 21. 6. 1997, V. Furlan leg.
Loški potok: Retje, VL66, 27. 5. 1998, V. Furlan leg.
Additional record: Kostanjevica na Krki, Sajevce, Krakovski gozd, WL37, 27. – 28. 6. 2003, Z. Malinka leg., P. Kment det.

Polymerus palustris (Reuter, 1907)
Gogala & Moder, 1960: Ljubljana: Rakovnik; Gogala & Gogala, 1986, 1989
Specimens examined:
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Podsreda, Trebča Gorca, WM40, 9. 7. 1998, S. Brelih leg.

Polymerus unifasciatus (Fabricius, 1794)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Pokojišče, Log v Trenti; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 3. 7. 1977, A. & M. Gogala leg.
Vrhnika, Bistra, VL48, 18. 6. 1978, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg., 7. 6. 1987, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Ljubljansko barje: Ig, Iška loka, VL69, 10. 7. 1982, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Ajdovščina, VL18, 2. 8. 1985, A. & M. Gogala leg.
Istra: Labor, VL03, 9. 9. 1987, A. Gogala leg.
Kras: Brje pri Komnu, VL07, 9. 7. 1989, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 31. 7. 1996, A. Gogala leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.
Moravče, Prikrnica ob Drtijščici, VM71, 19. 5. 1997, S. Brelih leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
N. Gorica, Panovec, UL98, 15. 5. 2000, S. Brelih leg.
Ljubljana, Golovec, VL69, 6. 8. 1982, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Muljava, Bojanji Vrh, VL88, 15. 8. 1985, V. Furlan leg.
Trnovski gozd: Lokve, VL09, 27. 6. 1998, V. Furlan leg.
Loški potok, VL66, 31. 7. 1997, V. Furlan leg.

Polymerus vulneratus (Panzer, 1806)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986
Specimens examined:
Istra: Koper, Škocjanski zatok, VL04, 1. 7. 1979, A. & M. Gogala leg.
Portorož, UL84, 9. 7. 1980, A. & M. Gogala leg.
Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.

Polymerus holosericeus Hahn, 1831
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 30. 5. 1981, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 19. 8. 1981, A. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Horjul, Lesno brdo, VL49, 8. 6. 1986, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Cirkulane, Brezovec, WM83, 8. 8. 1998, S. Brelih leg.

Polymerus nigrita (Fallén, 1807)
Gogala & Gogala, 1986, 1989
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 22. 6. 1985 on *Galium*, A. & M. Gogala leg.
Rakitna, VL58, 22. 6. 1986, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Rakov Škocjan, VL47, 6. 6. 1998, A. Gogala leg.
Ig, Kremenica, VL68, 23. 5. 1998, S. Brelih leg.
Bistrica ob Sotli, WM50, 18. 5. 2000, S. Brelih leg.
Podsreda, Trebča Gorca, WM40, 18. 5. 2000, S. Brelih leg.

Rhabdomiris striatellus (Fabricius, 1794)
Calocoris quadripunctatus (Villers, 1789)
Calocoris ochromelas (Gmelin, 1790)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Laibach (= Ljubljana), 25. 5. 1944, Staudacher leg.
Ljubljana, Škofljica, VL69, 19. 5. 1979, A. & M. Gogala leg.
Dol na Kolpi, WL03, 1. – 5. 6. 1979, BIJH SAZU leg.
Log, Lukovica, VL59, 14. 5. 1983, A. & M. Gogala leg.
Prekmurje: Petanjci, WM86, 29. 4. 1983, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 31. 5. 1987, A. & M. Gogala leg.
Črni kal, VL14, 7. 6. 1987, A. & M. Gogala leg.
Lipica, VL15, 16. 5. 1992, A. & M. Gogala leg., 30. 5. 1982, 25. 5. 1985, V. Furlan leg.
Ig, Škrilje, Stražar, 720 m, VL68, 28. 5. 1999 on *Quercus*, A. & M. Gogala leg.
Kras: Veliki Dol, VL07, 5. 5. 2001 on *Quercus*, A. Gogala leg.
Slavnik, VL14, 9. 6. 1979, V. Furlan leg.
Ljubljana, Golovec, VL69, 26. 5. 1982, V. Furlan leg.
Gornji Ig, 600 m, VL68, 5. 6. 1982, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Topol, Osredek, VM50, 3. 6. 1984, V. Furlan leg.

Stenotus binotatus (Fabricius, 1794)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Trenta: Pod Javorščkom; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Log, Lukovica, VL59, 27. 6. 1977, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 3. 7. 1977, 3. 7. 1978, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Ig, Kremenica, VL68, 4. 7. 1976, S. Brelih leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Osilnica, Plešce, slov. str. reke, VL74, 27. 7. 1985, A. & M. Gogala leg.
Prekmurje: Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Sp. Brnik, VM62, 2. 9. 1988, M. Gogala leg.
Kras: Brje pri Komnu, VL07, 12. 6. 1989, M. Gogala leg.
Istra: Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Nanos: Šembijska bajta, 800 m, VL27, 14. 7. 1999, S. Brelih leg.
Koper, Škocjanski zatok, VL04, 23. 5. 2000, S. Brelih leg.
Sočerga, Veli Badin, VL13, 12. 6. 1990, V. Furlan leg.
Ratitovec, 1500 m, VM22, 3. 8. 1985, V. Furlan leg.
Senožeče, Gabrče, VL26, 20. 6. 1982, V. Furlan leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.

Taylorilygus apicalis (Fieber, 1861)
Lygocoris pallidulus (Blanchard, 1852)
Horváth, 1900: Portorož; Gogala & Gogala, 1986
Specimens examined:
Istra: Pomjan, VL04, 7. 9. 1985, A. & M. Gogala leg.
Strunjan, UL94, 16. 10. 1985, A. & M. Gogala leg.
Piran, UL84, 12. 9. 1990, A. & M. Gogala leg.
Ankaran, VL04, 28. 10. 2000, A. & M. Gogala leg.

Leptopterna dolabrata (Linnaeus, 1758)
Cimex riparius Scopoli, 1763
Scopoli, 1763; Gogala & Moder, 1960: Ljubljana, Bohinj, Krka, Trenta: Pod Javorščkom; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Log, Lukovica, VL59, 27. 6. 1977, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 28. 6. 1978, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 3. 7. 1978, A. & M. Gogala leg.
Ig, Kureščk, VL68, 21. 6. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Bloke: Nova vas, VL67, 28. 6. 1981, A. & M. Gogala leg.
Dolina Triglavskih jezer: Dvojno jezero (pri koči), VM03, 6. 7. 1983, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 8. 6. 1983, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Horjul, Lesno brdo, VL49, 8. 6. 1986, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Prekmurje: Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Idrija, Krekovše, VL19, 28. 6. 1988, M. Gogala leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Bizeljsko, Gregovce, WL59, 17. 5. 2000, S. Brelih leg.
Muljava, VL88, 19. 6. 1982, V. Furlan leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Unec, VL47, 9. 6. 1983, V. Furlan leg.
Kum, 1219 m, WM00, 20. 7. 1987, V. Furlan leg.
Loški potok, VL66, 21. 6. 1997, V. Furlan leg.

Leptopterna ferrugata (Fallén, 1807)
Gogala & Gogala, 1986, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 8. 6. 1983, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 9. 6. 1990, 14. 6. 1991, A. & M. Gogala leg.
Vremščica, VL26, 4. 7. 1992, 5. 7. 1999, A. & M. Gogala leg.

Megaloceroea recticornis (Geoffroy, 1785)
Megaloceraea linearis (Fuessly, 1775)
Notostira longicornis (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Bohinj, Zagorje, Trenta: Pod Javorščkom; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 3. 7. 1977, 9. 7. 1978, A. & M. Gogala leg.
Ig, Kureščk, VL68, 21. 6. 1980, A. & M. Gogala leg.
Kras: Kopriva, VL07, 22. 7. 1980, A. & M. Gogala leg.
Bloke: Nova vas, VL67, 28. 6. 1981, A. & M. Gogala leg.
Kras: Škocjan, VL25, 27. 6. 1981, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Planina, VL47, 28. 6. 1982, M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Brje pri Komnu, VL07, 12. 6. 1989, M. Gogala leg.
Istra: Pomjan, VL03, 9. 6. 1990, A. & M. Gogala leg.
Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.

Kamniško-Savinjske Alpe: Krvavec, VM62, 29. 7. 1992, A. & M. Gogala leg.
Ig, Škrilje, Stražar, 720 m, VL68, 9. 6. 1999, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 10. 6. 2000, A. Gogala leg.
Kamniško-Savinjske Alpe: Dom pod Storžičem, 1100 m, VM53, 24. 7. 1982, V. Furlan leg.
Senožeče, Gabrče, VL26, 20. 6. 1982, V. Furlan leg.

Myrmecoris gracilis (R.F. Sahlberg, 1848)
Gogala & Gogala, 1986, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Istra: Izola, UL94, 23. 6. 1983, A. & M. Gogala leg.
Zazid, Lipnik, VL13, 7. 7. 2001, A. Gogala leg.
Obrov, Golac, VL24, 10. 6. 1999, S. Brelih leg.

Notostira elongata (Geoffroy, 1785)
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Celje, WM22, 13. 8. 1968, I. Sivec leg.
Celje, Griže, WM12, 20. 8. 1968, I. Sivec leg.
Ljubljana: Savlje, VM60, 5. 3. 1977, A. & M. Gogala leg.
Koper, Škocjanski zatok, VL04, 18. 5. 1980, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 14. 5. 2000, A. Gogala leg.
Istra: Sečovlje, UL93, 20. 9. 1980, A. & M. Gogala leg.
Prekmurje: Dobrovnik, XM06, 23. 7. 1983, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 11. 7. 1986, A. & M. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 10. 9. 1988, A. & M. Gogala leg.
Movraž, Movraška vala, VL13, 18. 5. 1990, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 10. 2. 2000, A. & M. Gogala leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.
Karavanke: Košutnik, 1100 m, VM54, 20. 6. 2000, S. Brelih leg.

Notostira erratica (Linnaeus, 1758)
Montandon, 1886: Gorica; Gogala & Moder, 1960 (confused with *N. elongata);* Gogala & Gogala, 1986
Specimens examined:
Celje, Griže, WM12, 20. 8. 1968, I. Sivec leg.
Kamniško-Savinjske Alpe: Krvavec, VM62, 14. 6. 1981, A. & M. Gogala leg.
Dolina Triglavskih jezer: Dvojno jezero (pri koči), VM03, 6. 7. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Snežnik, 1700 m, VL54, 3. 6. 2000, A. Gogala leg.

Pithanus maerkelii (Herrich-Schaeffer, 1838)
Gräffe, 1911: Logatec; Gogala & Moder, 1960: Kofce; Gogala & Gogala, 1986
Specimens examined:
Karavanke: Košuta, Kofce, VM44, 2. 8. 1935, Staudacher leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 19. 6. 1983, A. Gogala leg.

Stenodema calcarata (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Bevke, VL59, 25. 5. 1977, A. & M. Gogala leg.
Ljubljana, Sostro, VL79, 21. 4. 1979, A. & M. Gogala leg.
Log, Lukovica, VL59, 12. 5. 1979, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Ig, VL69, 10. 7. 1982, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Postojna, Zagon, VL37, 21. 9. 1983, A. & M. Gogala leg.
Velike Bloke, 2 km E, VL67, 24. 8. 1985, A. & M. Gogala leg.
Sečovlje, UL93, 2. 10. 1986, M. Gogala leg.
Sp. Brnik, VM61, 7. 9. 1988, A. & M. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 10. 9. 1988, A. & M. Gogala leg.
Julijske Alpe: Stara Fužina, Voje, VM13, 25. 9. 1988, A. & M. Gogala leg.
Rakov Škocjan, VL47, 6. 6. 1998, A. Gogala leg.
Bloke: Volčje, VL67, 19. 8. 2005, A. Gogala leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
Dragonja, UL93, 4. 5. 2000, S. Brelih leg.
N. Gorica, Panovec, UL98, 15. 5. 2000, S. Brelih leg.

Stenodema algoviensis Schmidt, 1934
Gogala & Moder, 1960: Trigl. pogorje 1600 – 2200 m; Gogala & Gogala, 1986, 1989
Specimens examined:
Julijske Alpe: Komna, 1520 m, VM02, 14. 8. 1982, V. Furlan leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Mangart: Mangartsko sedlo, UM94, 2. 7. 1993, A. & M. Gogala leg.
Košuta: Tegoška gora, VM54, 14. 8. 1997, A. Gogala leg.
Luče, Dleskovška planota, VM73, 4. 9. 1984, V. Furlan leg.

Stenodema holsata (Fabricius, 1787)
Gogala & Moder, 1960: Bohinj, pl. Trebiščna (Trenta), Trigl. jezera, Stol, Pohorje; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 12. 6. 1977, 19. 6. 1977, 4. 6. 1978, A. & M. Gogala leg.

Borovnica, Pokojišče, VL48, 28. 6. 1978, A. & M. Gogala leg.
Kamniško-Savinjske Alpe: Velika planina, VM72, 15. 10. 1978, A. & M. Gogala leg.
Pokljuka, Pl. Lipanca, VM13, 2. 9. 1979, A. & M. Gogala leg.
Julijske Alpe: Pl. Dedno polje, VM03, 20. 7. 1980, A. & M. Gogala leg.
Krvavec, VM62, 14. 6. 1981, A. & M. Gogala leg.
Medvode, Preska, VM50, 4. 7. 1981, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 19. 8. 1981, A. Gogala leg.
Železniki, Rudno, VM32, 15. 8. 1981, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, 19. 4. 1987, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Dolina Triglavskih jezer, VM03, 14. 7. 1985, A. & M. Gogala leg.
Rakitna, VL58, 22. 6. 1986, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Pohorje: Lovrenška jezera, WM24, 23. 8. 1987, A. & M. Gogala leg.
Pohorje: Lovrenc, Jezerska jama (Ribnik), WM24, 23. 8. 1987, A. & M. Gogala leg.
Čaven, VL08, 11. 6. 1988, 22. 8. 1992, A. & M. Gogala leg.
Solčava, Žibovt – Kisla voda, VM74, 26. 6. 1988, A. & M. Gogala leg.
Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Sp. Brnik, VM61, 7. 9. 1988, A. & M. Gogala leg.
Stara Fužina, Voje, VM13, 25. 9. 1988, A. & M. Gogala leg.
Snežnik, VL54, 22. 7. 1992, A. & M. Gogala leg.
Lužarji, izvir Iške, VL67, 1. 5. 1999, A. Gogala leg.
Pokljuka: Vel. Blejsko barje, VM23, 5. 8. 2003, A. & M. Gogala leg.
Čaven, pl. koča, 1240 m, VL18, 27. 5. 1999, S. Brelih leg.
Karavanke: pl. Pungrat, 1440 m, VM54, 20. 6. 2000, S. Brelih leg.
Karavanke: Košutnik, 1100 m, VM54, 20. 6. 2000, S. Brelih leg.

Stenodema laevigata (Linnaeus, 1758)
? *Cimex testaceus* Scopoli, 1763
Scopoli, 1763 (?); Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Krka, Brežice, Črni kal, Piran; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljana: Šentvid, VM50, 12. 3. 1978, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 24. 6. 1977, A. & M. Gogala leg.
Begunje na Gorenjskem, VM33, 1. 5. 1978, A. & M. Gogala leg.
Radovljica, VM33, 4. 3. 1979, A. & M. Gogala leg.
Kraški rob: Črni kal, VL14, 15. 4. 1979, A. & M. Gogala leg.
Dobrova, VM50, 27. 5. 1979, A. & M. Gogala leg.
Istra: Koper, Škocjanski zatok, VL04, 18. 5. 1980, A. & M. Gogala leg.
Velike Lašče, VL77, 25. 5. 1980, A. & M. Gogala leg.
Janče, VM70, 7. 6. 1981, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 4. 10. 1981, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Goričko: Gornji Petrovci, WM98, 1. 5. 1983, A. & M. Gogala leg.
Dobrovnik, Bukovniško jezero, XM07, 30. 4. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Postojna, Zagon, VL37, 21. 9. 1983, A. & M. Gogala leg.
Vuhred, Hudi kot, WM15, 2. 6. 1986, M. Gogala leg.
Prekmurje: Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Idrija, Krekovše, VL19, 28. 6. 1988, M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 2. 5. 1989, M. Gogala leg.
Nova Gorica, Kromberk, UL98, 2. 10. 1990, A. & M. Gogala leg.
Vremščica, VL26, 9. 5. 1992, A. & M. Gogala leg.
Gorjansko, UL97, 1. 5. 2000, A. & M. Gogala leg.
Ig, Škrilje, VL68, 8. 6. 1997, S. Brelih leg.
N. Gorica, Panovec, UL98, 15. 5. 2000, S. Brelih leg.

Stenodema sericans (Fieber, 1861)
Horváth, 1887: Gorica; Gogala & Moder, 1960: Trenta: Pod Javorščkom, Log v Trenti, Slavnik, Črni kal; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kras: Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, 23. 6. 1991, A. & M. Gogala leg.
Hrpelje, VL15, 2. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Ig, VL69, 10. 7. 1982, A. & M. Gogala leg.
Solčava, Žibovt – Kisla voda, VM74, 26. 6. 1988, A. & M. Gogala leg.
Trstelj, UL98, 19. 8. 1990, A. & M. Gogala leg.
Sočerga, Veli Badin, VL13, 3. 10. 1990, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Mangart: Mangartsko sedlo, UM94, 2. 7. 1993, A. & M. Gogala leg.
Ilirska Bistrica, Štanga, VL44, 22. 7. 1992, A. & M. Gogala leg.
Nanos: Šembijska bajta, VL27, 10. 8. 1996, A. & M. Gogala leg.
Nanos: Sv. Hieronim – Pleša, VL27, 4. 7. 1998, A. & M. Gogala leg.
Čaven: Kucelj, VL08, 27. 6. 1998, A. & M. Gogala leg.
Snežnik, 1700 m, VL54, 3. 6. 2000, A. Gogala leg.

Julijske Alpe: Rombon – Pl. Goričica, UM83, 9. – 11. 6. 2000, A. Kapla leg.
Komen, Branik, VL07, 27. 5. 1998, S. Brelih leg.
Čaven, pl. koča, 1240 m, VL18, 27. 5. 1999, S. Brelih leg.
Breginj, Bela, UM72, 9. 8. 2000, S. Brelih leg.

Stenodema virens (Linnaeus, 1767)
Gogala & Moder, 1960: Pohorje

Teratocoris paludum J. Sahlberg, 1870
Gogala & Gogala, 1986, 1989; A. Gogala, 1992
Specimens examined:
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, 10. 9. 1988, A. & M. Gogala leg.

Trigonotylus caelestialium (Kirkaldy, 1902)
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 1. 9. 1979, A. & M. Gogala leg.
Dol na Kolpi, WL03, 28. 8. – 16. 9. 1979, BIJH SAZU leg.
Ljubljansko barje: Dragomer, VL59, 25. 7. 1980, A. & M. Gogala leg.
Medvode, Jeprca, VM51, 22. 8. 1981, A. & M. Gogala leg.
Istra: Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Velike Bloke, 2 km E, VL67, 24. 8. 1985, A. & M. Gogala leg.
Prekmurje: Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Goričko: Trdkova, WM89, 14. 6. 1987, A. & M. Gogala leg.
Logarska dolina, VM74, 25. 6. 1988, A. & M. Gogala leg.
Julijske Alpe: Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Sp. Brnik, VM61, 7. 9. 1988, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 7. 8. 1989, 21. 7. 1990, A. & M. Gogala leg.
Hrastnik, WM01, 9. 1997, A. Kapla leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.
Rakov Škocjan, VL47, 17. 8. 2001, A. Gogala leg.
Pokljuka: Barje Šijec, VM23, 5. 8. 2003, A. & M. Gogala leg.

Trigonotylus pulchellus (Hahn, 1834)
Gogala & Gogala, 1986
Specimens examined:
Istra: Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.

Trigonotylus ruficornis (Geoffroy, 1785)
Gogala & Moder, 1960 (probably confused with *T. coelestialium)*

Camponotidea saundersi (Puton, 1874)
Gogala & Gogala, 1986; A. Gogala, 1992
Specimens examined:
Istra: Ankaran, VL04, 8. 6. 1983 on *Spartium*, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.

Orthotylinae

Dimorphocoris saulii Wagner, 1965 (Fig. 2)
Wagner, 1965: Illyrien: Auremiano bei Triest (= Vremščica: holotype); Wagner, 1969: Mt. Auremiano (= Vremščica); Tamanini, 1982; Linnavuori, 1992; M. Gogala, 1992; A. Gogala, 1994; Vlach, 1998
Specimens examined:
Kras: Vremščica, VL26, 4. 7. 1992, 26. 6. 1999, A. & M. Gogala leg.
Vremščica, 800 m, VL26, 11. 6. 2000, A. & M. Gogala leg.

Fig. 2: *Dimorphocoris saulii* ***Wagner, female in her habitat.***
Sl. 2: *Dimorphocoris saulii* ***Wagner, samica v svojem življenjskem okolju.***

Note: Endemic species, living exclusively in the dry grasslands on the Mountain Vremščica, 800-930 m a.s.l. (Fig. 4)

Dimorphocoris schmidti (Fieber, 1858) (Fig. 3)
Orthocephalus schmidti Fieber, 1858
Fieber, 1858: Krain (= Kranjska, Carniola: type locality), Ferd. Schmidt leg.; Gogala & Moder, 1960: Doga niva, Schmidt leg.; Gogala & Gogala, 1986 (misinterpreted locality); M. Gogala, 1992; A. Gogala, 1994
Specimens examined:

Lectotype, here designated: ♂, glued on triangle, handwritten label: Doga niva (= Dolga njiva, Kamniško-Savinjske Alps), small green square of paper (indicating the collection of F. X. Fieber). F. J. Schmidt coll., PMSL
Kamniško-Savinjske Alpe: Krvavec, VM62, 29. 7. 1992, A. & M. Gogala leg.
Krvavec, Dolge njive, VM63, 29. 7. 1992, A. & M. Gogala leg.

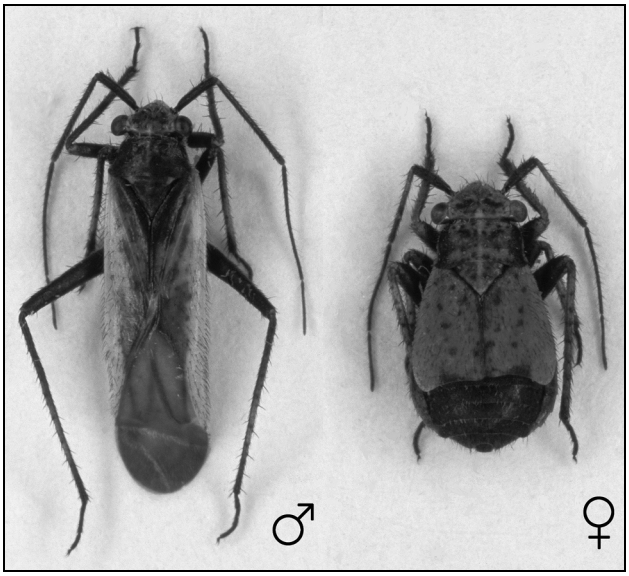

Fig. 3: A pair of** Dimorphocoris schmidti **Fieber from Krvavec (Kamniško-Savinjske Alps).
Sl. 3: Par Schmidtovih dvoličnikov (**Dimorphocoris schmidti **Fieber) s Krvavca (Kamniško-Savinjske Alpe).

Note: The type locality Doga niva (Dolga njiva in modern transcription) cannot be determined with certainty as there are several identically named places in Slovenia (Carniola). M. Gogala (1992) supposed that Dolge njive near Krvavec would be the place, because we found the species there (Fig. 4). But not far from there, also in the Kamniško-Savinjske Alps, Dolga njiva near Zaplata (VM53) is situated. I think this could be the actual type locality, because the locality Zaplata is indicated as the finding place of another species in the F.J. Schmidt collection and we are sure he collected in the environs.

Halticus apterus (Linnaeus, 1758)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Dobrova, Iška, Bohinj, pl. Trebiščna (Trenta), Gospodična; Gogala & Gogala, 1986; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 9. 8. 1978, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Bevke, VL59, 26. 8. 1980, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, M. Gogala leg.
Železniki, Rudno, VM32, 15. 8. 1981, A. & M. Gogala leg.
Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Bovec, UM83, 17. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Iška loka, VL69, 10. 7. 1982, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Osilnica, Plešce, slov. str. reke, VL74, 27. 7. 1985, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Goričko: Ocinje, WM78, 14. 6. 1987, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Julijske Alpe: Stara Fužina, Voje, VM13, 25. 9. 1988, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 18. 6. 1989, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 7. 7. 2000, A. Gogala leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.
Istra: Hrvoji, VL03, 21. 7. 1997, S. Brelih leg.
Dobrunje, Sv. Urh, VL69, 25. 6. 1997, V. Furlan leg.
Hrpelje, Prešnica, VL14, 13. 7. 1998, S. Brelih leg.
Podsreda, Loke, WM40, 9. 7. 1998, S. Brelih leg.
N. Gorica, Panovec, UL98, 6. 7. 2000, S. Brelih leg.
Breginj, Bela, UM72, 20. 7. 2000, S. Brelih leg.

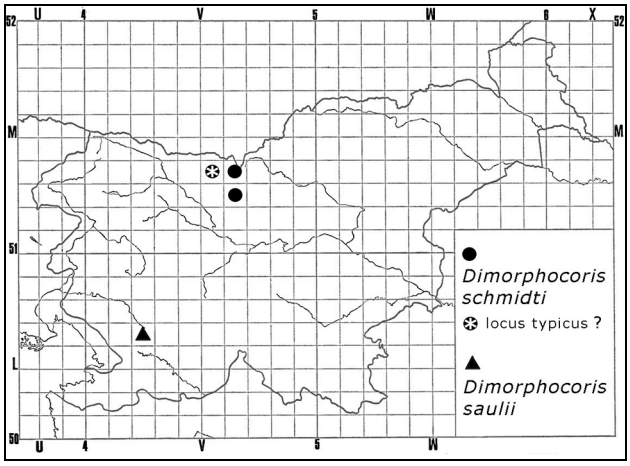

Fig. 4: The distribution of** D. schmidti **in Slovenia with the supposed type locality, and location of Mt. Vremščica, the only known residence of** D. saulii**.
Sl. 4: Razširjenost vrste** D. schmidti **v Sloveniji z verjetnim tipskim najdiščem, in lega Vremščice, edinega znanega prebivališča vrste** D. saulii**.

Halticus henschii Reuter, 1888
Montandon, 1886: Gorica; Reuter, 1888: Gorica (type locality) (Fig. 5); A. Gogala, 2002
Specimens examined:
Nanos: Sv. Hieronim, VL27, 25. 7. 1992, 8. 8. 2000, A. & M. Gogala leg.
Trnovski gozd: Čaven, VL08, 22. 8. 1992, A. & M. Gogala leg.

Kras: Brje pri Komnu, VL07, 24. 6. 2000, A. & M. Gogala leg.
Trstelj, UL98, 25. 6. 2000, 1. 7. 2001, A. & M. Gogala leg.
Otlica, Otliški maj, VL18, 14. 7. 2001, A. Gogala leg.
Kraški rob: Zazid, Lipnik, VL13, 2. 8. 2001 on *Genista sericea*, A. Gogala leg.
Podgorje, Golič, VL13, 13. 8. 2002, A. Gogala leg.
Additional record: Sela na Krasu, UL97, 29. – 30. 6. 2002, 20. – 22. 6. 2003, Z. Malinka leg., P. Kment det.

Note: The extent of dark basal pigmentation of hind femora among specimens of the same population of *H. henschii* in the region is very variable. This variability, however, is not accompanied by other morphological differences. My opinion is that only one species exists here and the closely related *Halticus puncticollis* Fieber, 1870 was recorded from the region by misidentification. The foodplant of *H. henschii* is *Genista sericea* (Fabaceae).

Halticus luteicollis (Panzer, 1804)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Bohinj; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljana: Šiška, VM50, 27. 6. 1979, 3. 9. 1980, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 24. 7. 1979, A. & M. Gogala leg.
Istra: Portorož, UL84, 9. 7. 1980, A. & M. Gogala leg.
Portorož, Lucija, UL94, 2. 7. 1983, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Osp, VL14, 8. 7. 1990, 9. 6. 2001, A. & M. Gogala leg.
Cerknica, Dolenja vas, VL47, 21. 8. 1997, S. Brelih leg.
Prekmurje: Sotina, WM78, 30. 7. 1998, S. Brelih leg.

Halticus pusillus (Herrich-Schaeffer, 1835)
Gogala & Moder, 1960: Črni kal; Gogala & Gogala, 1986, 1994
Specimens examined:
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Istra: Sočerga, VL13, 26. 7. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Popetre, VL03, 9. 7. 1997, S. Brelih leg.

Orthocephalus brevis (Panzer, 1798)
Gogala & Moder, 1960: Škocjan (Divača); Gogala & Gogala, 1986, 1989
Specimens examined:
Črnatal (= Kamnik, dolina Črne), VM72, 4. 6. 1934, Staudacher leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 14. 5. 1989, 27. 5. 2000, A. & M. Gogala leg.
Bovec, Plužna, UM83, 13. 5. 1998, S. Brelih leg.
Kras: Lipica, VL15, 30. 5. 1982, 25. 5. 1985, V. Furlan leg.
Gornji Ig, 600 m, VL68, 5. 6. 1982, V. Furlan leg.

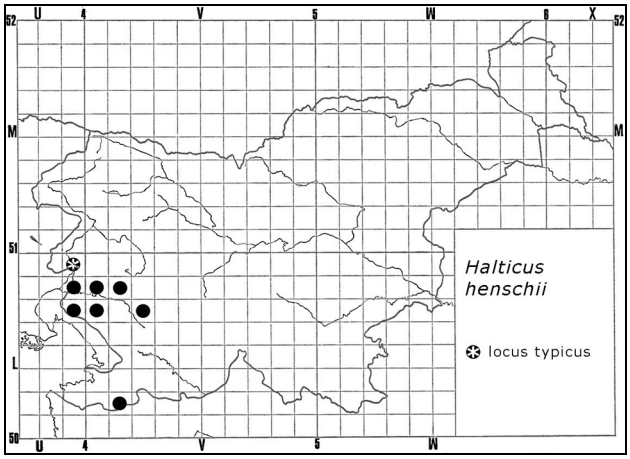

Fig. 5: The distribution of *Halticus henschii* ***Reuter in Slovenia.***
Sl. 5: Razširjenost vrste *Halticus henschii* ***Reuter v Sloveniji.***

Orthocephalus saltator (Hahn, 1835)
Orthocephalus mutabilis auct. (non Fallén, 1807)
Orthocephalus ferrarii Reuter, 1891
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 10. 6. 1979, 13. 7. 1980, A. & M. Gogala leg.
Vipavska dolina: Renče, UL98, 22. 7. 1980, A. & M. Gogala leg.
Prekmurje: Dobrovnik, XM06, 23. 7. 1983, A. & M. Gogala leg.
Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.

Orthocephalus vittipennis (Herrich-Schaeffer, 1835)
Gogala & Gogala, 1986, 1989
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljana, Črnuče, VM60, 21. 6. 1982, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 1. 7. 1983, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.

Pachytomella parallela (Meyer-Dür, 1843)
Gogala & Moder, 1960: Trigl. jezera, Komna, pl. Trebščna (Trenta); Gogala & Gogala, 1986, 1989
Specimens examined:
Julijske Alpe: Komna, 1520 m, VM02, 14. 8. 1982, V. Furlan leg.
Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.

Strongylocoris atrocoeruleus (Fieber, 1864)
Gogala & Gogala, 1986
Specimens examined:
Istra: Seča, UL94, 6. 6. 1978, M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Kraški rob: Podpeč, VL14, 14. 6. 1991, A. & M. Gogala leg.
Nanos: Sv. Hieronim – Pleša, VL27, 4. 7. 1998, A. & M. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.
Planinsko polje: Laze, VL47, 30. 6. 2001, A. Gogala leg.

Strongylocoris erythroleptus A. Costa, 1853
Montandon, 1886: Gorica; Gogala & Gogala, 1986
Specimen examined:
Istra: Padna, UL93, 16. 6. 1984, A. & M. Gogala leg.

Strongylocoris leucocephalus (Linnaeus, 1758)
Gogala & Moder, 1960 (confused with *S. steganoides);* Gogala & Gogala, 1986, 1989 (confused with *S. steganoides),* 1994
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljana: Savlje, VM60, 10. 6. 1983, M. Gogala leg.
Gomilica, XM06, 13. 6. 1987, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Goričko: Trdkova, WM89, 14. 6. 1987, A. & M. Gogala leg.
Ocinje, WM78, 14. 6. 1987, A. & M. Gogala leg.
Istra: Sočerga, Veli Badin, VL13, 18. 5. 1990, A. & M. Gogala leg.
Kraški rob: Bezovica, VL14, 14. 6. 1991, A. & M. Gogala leg.
Hrastnik, Krnice, WM00, 26. 5. 1997, M. Gogala leg.
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.
Ljubljana, Golovec, VL69, 4. 6. 1982, 18. 6. 1982, V. Furlan leg.
Kum, 1219 m, WM00, 20. 7. 1987, V. Furlan leg.

Strongylocoris steganoides (J. Sahlberg, 1875)
Specimens examined:
Julijske Alpe: Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Vršič, Vratca, 1800 m, VM04, 1. 8. 2001, A. & M. Gogala leg.

Blepharidopterus angulatus (Fallén, 1807)
Blepharidopterus brevicornis (Wagner, 1947)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Laibach (= Ljubljana), 15. 9. 1944, Staudacher leg.
Ljubljansko barje: Notranje Gorice, VL59, 24. 6. 1979, A. & M. Gogala leg.
Dol na Kolpi, WL03, 28. 8. – 16. 9. 1979, BIJH SAZU leg.
Ljubljana: Šiška, VM50, 19. 8. 1981, A. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Brkini: Artviže, VL25, 28. 7. 1984, A. & M. Gogala leg.
Osilnica, Plešce, slov. str. reke, VL74, 27. 7. 1985 on *Alnus*, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Braniška dol.: Sp. Branica, Čipnje, VL07, 18. 7. 1991, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 4. 8. 1991, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 31. 7. 1996, A. Gogala leg.

Cyllecoris histrionius (Linnaeus, 1767)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Ig, Zagorje, Klanec pri Hrpeljah; Gogala & Gogala, 1986, 1989
Specimens examined:
Zagorje ob Savi, WM01, 12. 6. 1932, Staudacher leg.
Hrpelje, Klanec pri Kozini, VL15, 14. 6. 1942, Staudacher leg.
Ig, VL69, 9. 6. 1940, Staudacher leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Kočevje, VL85, 6. – 14. 6. 1979, BIJH SAZU leg.
Ljubljana: Šiška, VM50, 25. 6. 1980 on *Quercus*, A. Gogala leg.
Kras: Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 31. 5. 1987, A. & M. Gogala leg.
Goričko: Trdkova, WM89, 14. 6. 1987, A. & M. Gogala leg.
Prekmurje: Mala Polana, Črni log, XM06, 23. 5. 1992, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.
Gornji Ig, 600 m, VL68, 5. 6. 1982, V. Furlan leg.

Dryophilocoris luteus (Herrich-Schaeffer, 1835)
Gogala & Gogala, 1986, 1989; A. Gogala, 1992
Specimens examined:
Kras: Lipica, VL15, 30. 5. 1982, 25. 5. 1985 on *Quercus*, V. Furlan leg.
Ig, Škrilje, Stražar, VL68, 15. 5. 2000 on *Quercus*, 30. 5. 2000, A. & M. Gogala leg.

Dryophilocoris flavoquadrimaculatus (De Geer, 1773)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Laibach (= Ljubljana), 23. 5. 1944, Staudacher leg.
Ljubljana, Škofljica, VL69, 19. 5. 1979, A. & M. Gogala leg.
Prekmurje: Petanjci, WM86, 29. 4. 1983, A. & M. Gogala leg.
Ljubljana: Mestni log, VL59, 14. 5. 1983, A. & M. Gogala leg.
Moravci, WM97, 30. 4. 1983, A. & M. Gogala leg.
Brežice, Čatež ob Savi, WL48, 6. 5. 1986, M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 31. 5. 1987, A. & M. Gogala leg.
Kras: Lipica, VL15, 16. 5. 1992, A. & M. Gogala leg., 30. 5. 1982, 25. 5. 1985, V. Furlan leg.
Ig, Škrilje, Stražar, VL68, 15. 5. 2000 on *Quercus*, A. & M. Gogala leg.
Kras: Veliki Dol, VL07, 5. 5. 2001, A. Gogala leg.
Krim: Planinca, VL59, 13. 5. 2001, A. & M. Gogala leg.

Petišovci, Murska šuma, XM14, 30. 4. 2001, S. Gomboc & D. Kofol leg.
Bela krajina: Semič, WL15, 30. 4. 1983, V. Furlan leg.

Globiceps novaki Wagner, 1950
Specimen examined:
Kras: Veliki Dol, VL07, 27. 5. 2001 on *Quercus*, A. Gogala leg.

Globiceps sphaegiformis (Rossi, 1790)
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 24. 7. 1979, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Ilirska Bistrica, Jelšane, VL43, 21. 6. 1983, M. Gogala leg.
Brkini: Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 9. 8. 1984, A. & M. Gogala leg.
Hotedršica, Novi svet, VL38, 19. 7. 1984, S. Brelih leg.
Ljubljansko barje: Log, Lukovica, VL59, 21. 6. 1987 on *Malus*, 10. 6. 2001, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Hrastnik, WM01, 6. 6. 1999, A. & M. Gogala leg.

Globiceps flavomaculatus (Fabricius, 1794)
Horváth, 1887: Gorica ("♀ avec le vertex caréné" – It could not be *G. flavomaculatus*. The record probably refers to *G. fulvicollis);* Gogala & Gogala, 1986
Specimens examined:
Posavje, 5. 7. 1954, M. Gogala leg.
Bohinj: Ukanc, VM02, 3. 7. 1977, A. & M. Gogala leg.
Ljubljana: Šiška, VM50, 11. 7. 1979, A. Gogala leg.
Medvode, Goričane, VM51, 15. 7. 1980, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.

Globiceps fulvicollis Jakovlev, 1877
Globiceps cruciatus Reuter, 1879
? *Globiceps horvathi* Reuter, 1912
Gogala & Moder, 1960: Posavje, Črnuče; Gogala & Gogala, 1986, 1989, 1994 (as *G. horvathi)*
Specimens examined:
Ljubljansko barje: Dragomer, VL59, 7. 7. 1979, A. Gogala leg.
Črni kal, VL14, 30. 6. 1979, 28. 6. 1980, A. & M. Gogala leg.
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.
Kras: Kopriva, VL07, 22. 7. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Slavnik, VL14, 28. 6. 1982, M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Brkini: Barka, VL25, 28. 7. 1984, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 10. 7. 1985, A. & M. Gogala leg.
Istra: Koštabona, VL03, 7. 6. 1987, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Brje pri Komnu, VL07, 12. 6. 1989, M. Gogala leg., 18. 6. 1989, A. & M. Gogala leg.
Kraški rob: Črnotiče, VL14, 8. 7. 1990, A. & M. Gogala leg.
Vremščica, VL26, 5. 7. 1999, A. & M. Gogala leg.
Ljubljana, Črnuče, Jarški prod, VM60, 23. 6. 2004, A. Gogala leg.
Sočerga, Šeki, VL13, 14. 6. 1999, 17. 6. 1999, S. Brelih leg.
Nanos: Šembijska bajta, 800 m, VL27, 14. 7. 1999, S. Brelih leg.
Podsreda, Trebča Gorca, WM40, 18. 5. 2000, S. Brelih leg.
Koper, Škocjanski zatok, VL04, 30. 5. 2002, S. Brelih leg.
Istra: Zazid, 380 m, VL14, 26. 5. 2003, S. Brelih leg.

Note: The status of *G. horvathi* is doubtful after the synonymisation of *Globiceps cruciatus* with *G. fulvicollis*. My opinion is that it should be synonymized too.

Heterocordylus cytisi Josifov, 1958
Gogala & Gogala, 1986
Specimens examined:
Prekmurje: Selo, WM97, 5. 7. 1980, A. & M. Gogala leg.
Janče, VM70, 7. 6. 1981, A. & M. Gogala leg.
Prekmurje: Andrejci, WM97, 23. 5. 1989, V. Furlan leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ljubljana, Golovec, VL69, 4. 6. 1982, V. Furlan leg.

Heterocordylus farinosus Horváth, 1887
Gogala & Moder, 1960: Slavnik; Gogala & Gogala, 1986, 1994
Specimens examined:
Slavnik, VL14, 31. 5. 1981, A. & M. Gogala leg.
Kras: Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Istra: Sočerga, Veli Badin, VL13, 18. 5. 1990, A. & M. Gogala leg.
Ilirska Bistrica, Štanga, VL44, 22. 7. 1992, 3. 6. 2000, A. & M. Gogala leg.
Ilirska Bistrica, V. Milanja, VL44, 22. 6. 2003, A. Gogala leg.
Kraški rob: Zazid, Zalipnik, VL13, 26. 5. 2000, A. Gogala leg.
Brje pri Komnu, VL07, 27. 5. 2000, A. & M. Gogala leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Senožeče, Gabrče, VL26, 20. 6. 1982, V. Furlan leg.
Ilirska Bistrica, Župnica, VL44, 4. 7. 2005, S. Brelih leg.
Additional record: Kamniško-Savinjske Alpe: Logarska dolina, 700 – 1100 m, VM74, 21. – 24. 6. 2005, J. Kolibáč leg., P. Kment det.

Heterocordylus genistae (Scopoli, 1763)
Cimex genistae Scopoli, 1763
Scopoli, 1763: Carniolia (western Slovenia – type locality); Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Borovnica, Pokojišče, VL48, 28. 6. 1978, A. & M. Gogala leg.
Kamnik pod Krimom, Žalostna gora, VL59, 26. 5. 1979, A. & M. Gogala leg.

Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Planinsko polje: Laze, VL47, 11. 6. 1982, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.
Ig, Kremenica, VL68, 23. 5. 1998, S. Brelih leg.
Kras: Lipica, VL15, 30. 5. 1982, V. Furlan leg.
Muljava, VL88, 12. 6. 1985, V. Furlan leg.

Heterocordylus leptocerus (Kirschbaum, 1856)
Gogala & Moder, 1960: Tomačevo, Planina na Kraju, Komarča; Gogala & Gogala, 1986
Specimens examined:
Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Julijske Alpe: Komna, VM02, 7. 7. 1983 on *Genista*, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Mangart, Mangartsko sedlo, UM94, 2. 7. 1993, A. & M. Gogala leg.

Heterocordylus tibialis (Hahn, 1833)
Gogala & Gogala, 1986
Specimens examined:
Istra: Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Koper, Škocjanski zatok, VL04, 23. 5. 2000, S. Brelih leg.

Heterocordylus tumidicornis (Herrich-Schaeffer, 1835)
Gogala & Gogala, 1989
Specimens examined:
Prekmurje: Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Goričko: Trdkova, WM89, 14. 6. 1987, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 28. 5. 1993, A. & M. Gogala leg.
Podsreda, Trebča Gorca, WM40, 18. 5. 2000, S. Brelih leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Ig, Kurešček, VL68, 5. 6. 1983, V. Furlan leg.
Brkini: Rodik, VL25, 500 m, 7. 6. 2001, S. Brelih leg.

Heterotoma merioptera (Scopoli, 1763)
Cimex meriopterus Scopoli, 1763
Heterotoma dalmatina (Wagner, 1950)
Scopoli, 1763: Carniolia (western Slovenia – type locality); Reuter, 1888: Gorica; Gräffe, 1911: Tolmin; Gogala & Moder, 1960: Bohinj, Zagorje; Gogala & Gogala, 1986, 1989
Specimens examined:
Istra: Portorož, Bernardin, UL84, 9. 7. 1980, A. Gogala leg.
Ljubljansko barje: Podpeč, VL59, 6. 8. 1983 on *Acer campestre*, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.

Malacocoris chlorizans (Panzer, 1794)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, Nemški rovt, VM22, 15. 8. 1981, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 16. 8. 1981 on *Corylus*, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Bela krajina: Vinica, Zilje, WL23, 13. 9. 1981, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 10. 8. 1983, A. & M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 7. 9. 1989, A. & M. Gogala leg.

Mecomma dispar (Boheman, 1852)
A. Gogala, 1996
Specimen examined:
Pohorje: Pesek, 1300 m, WM24, 11. 8. 1991, A. & M. Gogala leg.

Mecomma ambulans (Fallén, 1807)
Gogala & Gogala, 1986
Specimens examined:
Bohinjska Bistrica, Nemški rovt, VM22, 25. 7. 1979, A. & M. Gogala leg.
Kranjska Gora, Rateče, VM05, 1. 8. 1980, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.

Orthotylus ericetorum (Fallén, 1807)
Orthotylus ericetorum carneae Wagner, 1949
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Grosuplje, Polica, VL79, 27. 9. 1980, A. & M. Gogala leg.
Bela krajina: Vinica, Zilje, WL23, 13. 9. 1981, A. & M. Gogala leg.
Kokra, VM63, 14. 8. 1983, A. & M. Gogala leg.
Sp. Brnik, VM61, 7. 9. 1988 on *Calluna*, A. & M. Gogala leg.
Logatec, Zaplana: Jezerce, VL38, 2. 8. 2000, A. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 25. 8. 2005 on *Calluna vulgaris*, A. Gogala leg.

Orthotylus flavosparsus (C.R. Sahlberg, 1841)
Gogala & Gogala, 1986, 1989
Specimens examined:
Prekmurje: Lendava, XM15, 6. 7. 1980, A. & M. Gogala leg.
Istra: Sečovlje, UL93, 2. 10. 1986, M. Gogala leg.
Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.
Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.

Orthotylus palustris Reuter, 1888
Montandon, 1886: Gorica; Reuter, 1888: Gorica (type locality); Gräffe, 1911: Tolmin; Gogala & Gogala, 1986; A. Gogala, 1992
Specimens examined:
Istra: Sečovlje, UL93, 20. 9. 1980, A. & M. Gogala leg.
Sečovlje, Fontanigge, UL93, 20. 6. 2001, 17. 9. 2002, A. Gogala leg.
Strunjan, UL94, 30. 9. 1979, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 6. 5. 2000, 14. 5. 2000 on *Arthrocnemum*, 23. 5. 2000, 10. 6. 2000, 22. 7. 2000, 8. 8. 2000, 11. 8. 2000 on *Salicornia*, A. Gogala leg.
Ankaran, VL04, 28. 10. 2000, A. Gogala leg.

Orthotylus rubidus (Puton, 1874)
Specimens examined:
Istra: Koper, Bertoki, Škocjanski zatok, VL04, 11. 8. 2000 on *Salicornia*, A. Gogala leg.

Orthotylus flavinervis (Kirschbaum, 1856)
Gogala & Gogala, 1986
Specimens examined:
Ljubljansko barje: Vrhnika, Log, VL59, 15. 7. 1984, A. & M. Gogala leg.

Orthotylus interpositus Schmidt, 1938
Gogala & Gogala, 1986 (partly confused with *O. marginalis)*
Specimens examined:
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.

Orthotylus marginalis Reuter, 1883
Gogala & Gogala, 1986, 1989
Specimens examined:
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 3. 7. 1977, A. & M. Gogala leg.
Ig, Iška, VL68, 10. 6. 2005 on *Salix*, A. Gogala leg.
Rakov Škocjan, VL47, 17. 6. 2005 on *Salix*, A. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.

Orthotylus nassatus (Fabricius, 1787)
Gogala & Moder, 1960: Ljubljana

Orthotylus obscurus Reuter, 1875
Gogala & Gogala, 1986; Floren & Gogala, 2002
Specimens examined:
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Kočevski Rog: Baza 20, 900 m, WL06, 28. 6. 1999 on *Abies alba,* A. Floren leg.

Orthotylus prasinus (Fallén, 1826)
Gogala & Gogala, 1986
Specimens examined:
Log, Lukovica, VL59, 24. 6. 1979, 1. 7. 1983 on *Ulmus*, A. & M. Gogala leg.
Kras: Hrpelje, VL15, 2. 7. 1982, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.

Orthotylus quercicola Reuter, 1885
Gogala & Gogala, 1986
Specimens examined:
Kras: Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.

Orthotylus tenellus (Fallén, 1807)
Specimens examined:
Hrastnik, WM01, 23. 5. 2000, A. Kapla leg.
Ig, Škrilje, Stražar, VL68, 30. 5. 2000, A. & M. Gogala leg.

Orthotylus viridinervis (Kirschbaum, 1856)
Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Laško, Šmohor, WM11, 13. 7. 1984 on *Tilia*, A. & M. Gogala leg.

Orthotylus beieri Wagner, 1942
A. Gogala, 1991
Specimens examined:
Julijske Alpe: Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.

Orthotylus virescens (Douglas & Scott, 1865)
A. Gogala, 1991
Specimens examined:
Julijske Alpe: Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.

Orthotylus fuscescens (Kirschbaum, 1856)
Gogala & Gogala, 1986
Specimens examined:
Kamniško-Savinjske Alpe: Krvavec, VM62, 14. 6. 1981, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 1. 6. 2000, 5. 6. 2000, A. & M. Gogala leg.

Orthotylus bilineatus (Fallén, 1807)
Gogala & Gogala, 1986
Specimen examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.

Platycranus boreae Gogala, 2002
A. Gogala, 2002
Specimens examined (holotype and paratypes):
Kraški rob: Zazid, Lipnik, VL13, 7. 7. 2001 on *Genista sericea*, A. & M. Gogala leg., 2. 8. 2001 on *Genista sericea*, A. Gogala leg.
Zazid, Lipnik, 800 m, VL13, 17. 6. 2000, A. Gogala leg.

Note: Endemic species, known so far only from the type locality.

Platycranus metriorrhynchus Reuter, 1883
Gogala & Gogala, 1986
Specimens examined:
Bohinj: Ukanc, VM12, 16. 8. 1981 on *Genista*, A. & M. Gogala leg.
Julijske Alpe: Komna – Vratca, VM02, 26. 8. 1990, A. & M. Gogala leg.

Platycranus erberi Fieber, 1870
Gogala & Gogala, 1986
Specimens examined:
Istra: Padna, UL93, 4. 11. 1983 on *Spartium*, A. & M. Gogala leg.
Strunjan, UL94, 16. 10. 1985, A. & M. Gogala leg.

Pseudoloxops coccineus (Meyer-Dür, 1843)
Gogala & Gogala, 1986
Specimens examined:
Vrhnika, Log, VL59, 15. 7. 1984 on *Fraxinus*, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.

Reuteria marqueti Puton, 1875
Reuter, 1888: Gorica

Phylinae

Hypseloecus visci (Puton, 1888)
Specimens examined:
Krško, Anovec, WL49, 1. 8. 1996, A. & M. Gogala leg.

Pilophorus cinnamopterus (Kirschbaum, 1856)
Gogala & Moder, 1960: Bohinj; Gogala & Gogala, 1986, 1994
Specimens examined:
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Velike Bloke, Ulaka, VL57, 7. 8. 1983, A. & M. Gogala leg.
Velike Bloke, 2 km E, VL67, 24. 8. 1985 on *Pinus*, A. & M. Gogala leg.
Istra: Osp, VL14, 8. 7. 1990, A. & M. Gogala leg.

Pilophorus clavatus (Linnaeus, 1767)
Montandon, 1886: Gorica; Gräffe, 1911: Logatec; Gogala & Moder, 1960: Ljubljana, Bohinj; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 24. 8. 1980, 16. 8. 1981 on *Salix*, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 16. 8. 1983, A. & M. Gogala leg.
Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Rovte, Smrečje, VL39, 22. 7. 1985, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 10. 9. 1988, A. & M. Gogala leg.

Pilophorus confusus (Kirschbaum, 1856)
Gogala & Moder, 1960: Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 29. 6. 1979, 19. 8. 1981 on *Salix*, A. Gogala leg.
Medvode, Goričane, VM51, 15. 7. 1980, A. & M. Gogala leg.
Cerknica, Begunje, Topol, VL57, 28. 6. 1981 on *Salix*, A. & M. Gogala leg.
Ljubljansko barje: Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Prekmurje: Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Cerkniško jezero: Dolenje Jezero, VL56, 10. 9. 1988, A. & M. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, 3. 8. 2002, A. Gogala leg.

Pilophorus perplexus Douglas & Scott, 1875
Montandon, 1886: Gorica; Gogala & Moder, 1960: Ljubljana, Lubnik; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Ljubljana: Šiška, VM50, 29. 6. 1979, A. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 14. 9. 1982, 22. 6. 1985 on *Malus*, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Istra: Osp, VL14, 8. 7. 1990, A. & M. Gogala leg.
Stara vas – Bizeljsko, WL59, 6. 8. 1996, A. & M. Gogala leg.
Kozloviči, VL03, 9. 7. 1997, S. Brelih leg.

Pilophorus simulans Josifov, 1989
Pilophorus pusillus auct. (non Reuter, 1878)
Gogala & Moder, 1960: Ljubljana, Bohinj; Gogala & Gogala, 1989; A. Gogala, 1996
Specimen examined:
Istra: Koštabona, Supotski slap, VL03, 12. 10. 1988, A. & M. Gogala leg.

Cremnocephalus alpestris Wagner, 1941
Gogala & Gogala, 1986; Floren & Gogala, 2002
Specimens examined:
Karavanke: Peca, VM85, 13. 8. 1962, E. Pretner leg.
Rakitna, VL58, 31. 7. 1984 on *Picea*, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Kočevski Rog: Baza 20, 900 m, WL06, 25. 6. 1999, 26. 6. 1999, on *Abies alba,* A. Floren leg.

Hallodapus suturalis (Herrich-Schaeffer, 1837)
Montandon, 1886: Gorica

Mimocoris rugicollis (A. Costa, 1853)
Mimocoris coarctatus auct. (non Mulsant & Rey, 1852)
Horváth, 1887: Gorica; Reuter, 1888: Gorica

Omphalonotus quadriguttatus (Kirschbaum, 1856)
Reuter, 1888: Gorica

Systellonotus triguttatus (Linnaeus, 1767)
Montandon, 1886: Gorica; Gogala & Moder, 1960: Lancovo, Črni kal; Gogala & Gogala, 1986
Specimens examined:

Kamnik pod Krimom, Žalostna gora, VL59, 26. 5. 1979, A. & M. Gogala leg.
Ig, Kurešček, VL68, 21. 6. 1980, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 18. 6. 1989, 21. 7. 1990, A. & M. Gogala leg.
Sočerga, Šeki, VL13, 14. 6. 1999, S. Brelih leg.

Amblytylus nasutus (Kirschbaum, 1856)
Gogala & Moder, 1960; Gogala & Gogala, 1986, 1989; Floren & Gogala, 2002
Specimens examined:
Prekmurje: Lendava, XM15, 6. 7. 1980, A. & M. Gogala leg.
Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Kočevski Rog: Baza 20, 900 m, WL06, 26. 6. 1999, A. Floren leg.

Atomoscelis onusta (Fieber, 1861)
Gogala & Gogala, 1986
Specimens examined:
Istra: Strunjan, UL94, 22. 9. 1982, A. & M. Gogala leg.

Atractotomus kolenatii (Flor, 1860)
Gogala & Gogala, 1986; Floren & Gogala, 2002
Specimens examined:
Kočevje, VL85, 28. 6. – 12. 7. 1979, BIJH SAZU leg.
Kočevski Rog: Baza 20, 900 m, WL06, 25. 6. 1999, 26. 6. 1999, on *Abies alba,* A. Floren leg.

Atractotomus magnicornis (Fallén, 1807)
Reuter, 1888: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Pohorje: Lovrenc, Jezerska jama (Ribnik), WM24, 23. 8. 1987, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 10. 7. 1985, A. & M. Gogala leg.
Rovte, Smrečje, VL39, 22. 7. 1985, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Grosuplje, Polica, VL79, 27. 6. 1981 on *Picea*, A. & M. Gogala leg.
Jelovica, VM32, 24. 8. 1980, A. & M. Gogala leg.
Bohinjska Bistrica, Nemški rovt, VM22, 24. 8. 1980, A. & M. Gogala leg.

Atractotomus mali (Meyer-Dür, 1843)
Horváth, 1887: Gorica
Specimen examined:
Kočevska Reka, VL84, 4. 7. 1997, S. Brelih leg.

Brachyarthrum limitatum Fieber, 1858
Gogala & Gogala, 1989
Specimens examined:
Kočevje, VL85, 6. – 14. 6. 1979, 28. 6. – 12. 7. 1979, BIJH SAZU leg.

Campylomma annulicorne (Signoret, 1865)
Gogala & Gogala, 1986
Specimen examined:
Bela krajina: Vinica, Kot, WL13, 31. 7. 1974, M. Štangelj leg.

Chlamydatus pulicarius (Fallén, 1807)
Gogala & Moder, 1960: Bohinj; Gogala & Gogala, 1986, 1989
Specimens examined:
Log, Lukovica, VL59, 26. 5. 1979, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 10. 6. 1979, A. & M. Gogala leg.
Ljubljansko barje: Bevke, VL59, 14. 6. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Domžale, Dob, VM71, 24. 7. 1982, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983, A. & M. Gogala leg.
Prekmurje: Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Vinje pri Moravčah, VM71, 23. 5. 1997, A. Gogala leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
Murski Petrovci, WM87, 31. 7. 1998, S. Brelih leg.
Breginj, Bela, UM72, 20. 7. 2000, S. Brelih leg.
N. Gorica, Panovec, UL98, 15. 5. 2000, S. Brelih leg.
Bistrica ob Sotli, WM50, 18. 5. 2000, S. Brelih leg.

Compsidolon salicellum (Herrich-Schaeffer, 1841)
Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 24. 7. 1979, 16. 8. 1981 on *Corylus*, A. & M. Gogala leg.
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 10. 8. 1983, A. & M. Gogala leg.
Šmarje pri Jelšah, WM42, 17. 8. 1988, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 10. 8. 1990, A. & M. Gogala leg.

Criocoris crassicornis (Hahn, 1834)
Atractotomus apicalis Reuter, 1875
Reuter, 1875, 1884: Laibach (= Ljubljana), holotype of *A. apicalis*; Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Ig, VL69, 10. 7. 1982, A. & M. Gogala leg.
Notranje Gorice, VL59, 24. 6. 1979, A. & M. Gogala leg.
Istra: Koper, Škocjanski zatok, VL04, 1. 7. 1979, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 23. 8. 1980, A. & M. Gogala leg.
Kras: Štorje, VL16, 22. 7. 1980, A. & M. Gogala leg.
Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Bovec, UM83, 17. 7. 1982, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.

Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Blatna Brezovica, VL49, 18. 7. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987, A. & M. Gogala leg.
Kum, WM00, 26. 7. 1996, A. & M. Gogala leg.
Kraški rob: Zazid, Lipnik, VL13, 5. 6. 2001, A. Gogala leg.
Bovec – Kanin, UM83, 23. 7. 2000, S. Brelih leg.

Criocoris nigripes Fieber, 1861
Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 26. 5. 1979, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Pomurje: Veržej, WM86, 13. 6. 1987, A. & M. Gogala leg.
Breginj – Logje, UM72, 12. 6. 1997, S. Brelih leg.
Ig, Kurešček, VL68, 5. 6. 1983, V. Furlan leg.
Loški potok, VL66, 8. 6. 1997, V. Furlan leg.

Criocoris piceicornis Wagner, 1950
Gogala & Gogala, 1986
Specimens examined:
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Kras: Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.

Criocoris sulcicornis (Kirschbaum, 1856)
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Kras: Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Trnovski gozd: Čaven, VL08, 11. 6. 1988, A. & M. Gogala leg.
Nanos: Sv. Hieronim, VL27, 25. 7. 1992, A. & M. Gogala leg.
Krško, Anovec, WL49, 1. 8. 1996, A. & M. Gogala leg.
Obrov, Golac, VL24, 10. 6. 1999, S. Brelih leg.
Slavnik, 800 m, VL14, 24. 6. 1999, S. Brelih leg.
Additional record: Kamniško-Savinjske Alpe: Logarska dolina, 700 – 1100 m, VM74, 21. – 24. 6. 2005, J. Kolibáč leg., P. Kment det.

Europiella alpina (Reuter, 1875)
Gogala & Moder, 1960: Bohinj; Gogala & Gogala, 1986, 1989
Specimens examined:
Bela krajina: Črnomelj, Rožanec, WL15, 13. 9. 1981, A. & M. Gogala leg.
Soška dolina: izliv Lepenjice, UM93, 18. 7. 1982, A. & M. Gogala leg.
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Julijske Alpe: Stara Fužina, Voje, VM13, 25. 9. 1988, A. & M. Gogala leg.

Europiella artemisiae (Becker, 1864)
Plagiognathus albipennis auct. (non Fallén, 1829)
Gogala & Gogala, 1986 (as *P. albipennis*, confused with *E. decolor),* 1989
Specimens examined:
Ljubljana: Šiška, VM50, 3. 9. 1980, 19. 8. 1981, A. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Vipavska dolina: Ajdovščina, VL18, 2. 8. 1985, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 23. 8. 1985, A. & M. Gogala leg.
Prekmurje: Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Istra: Portorož, Beli križ, UL84, 10. 10. 1984, M. Gogala leg.
Sočerga, Veli Badin, VL13, 3. 10. 1990 on *Artemisia*, A. & M. Gogala leg.
Zazid, Lipnik, VL13, 5. 6. 2001, 16. 6. 2001, A. Gogala leg.
Gora: Otlica, Otliški maj, VL18, 14. 7. 2001, A. Gogala leg.

Europiella decolor (Uhler, 1893)
Specimens examined:
Istra: Strunjan, UL94, 18. 5. 1980, A. & M. Gogala leg.
Sečovlje, UL93, 21. 9. 1982, A. & M. Gogala leg.
Sečovlje, Fontanigge, UL93, 17. 9. 2002, A. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 14. 5. 2000 on *Artemisia caerulescens*, 23. 5. 2000, A. Gogala leg.

Harpocera thoracica (Fallén, 1807)
Gogala & Moder, 1960: Ljubljana: Rakovnik, Ljubljana; Gogala & Gogala, 1986, 1989
Specimens examined:
Kočevje, VL85, 23. 5. 1979, BIJH SAZU leg.
Prekmurje: Petanjci, WM86, 29. 4. 1983, A. & M. Gogala leg.
Dobrovnik, Bukovniško jezero, XM07, 30. 4. 1983, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 7. 5. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 4. 6. 1985, A. & M. Gogala leg.
Brežice, Čatež ob Savi, WL48, 6. 5. 1986, M. Gogala leg.
Tržič, Visoče, VM43, 10. 5. 1998, A. Gogala leg.
Krim: Planinca, VL59, 13. 5. 2001, A. & M. Gogala leg.
Sela na Krasu, UL97, 29. 4. 2001 on *Quercus*, A. Gogala leg.
Mrzlica, Preval Vrhe, WM01, 28. 5. 1991, V. Furlan leg.
Ig, Kremenica, VL68, 7. 5. 2000, S. Brelih leg.
Kras: Lipica, VL15, 30. 5. 1982, 25. 5. 1985, V. Furlan leg.
Bela krajina: Semič, Gornja Paka, WL15, 29. 4. 1983, V. Furlan leg.
Bela krajina: Semič, WL15, 30. 4. 1983, V. Furlan leg.
Bela krajina: Preloka, WL23, 27. 4. 1983, V. Furlan leg.
Bela krajina: Vinica, WL13, 29. 4. 1983, V. Furlan leg.
Muljava, VL88, 7. 5. 1983, V. Furlan leg.

Vremščica, VL26, 30. 5. 1982, V. Furlan leg.
Ljubljana, Golovec, VL69, 26. 5. 1982, V. Furlan leg.

Heterocapillus tigripes (Mulsant & Rey, 1852)
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 1. 7. 1979, 28. 6. 1980, A. & M. Gogala leg.
Kras: Štorje, VL16, 22. 7. 1980, 8. 6. 1983, A. & M. Gogala leg.
Istra: Koštabona, VL03, 25. 6. 1981, A. & M. Gogala leg.
Senožeče, VL26, 28. 6. 1982, M. Gogala leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Portorož, Lucija, UL94, 2. 7. 1983, A. & M. Gogala leg.
Koper, Sermin, VL04, 16. 6. 1984, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984, A. & M. Gogala leg.
Podgorski kras: Petrinje, VL14, 11. 7. 1986, A. & M. Gogala leg.
Dragonja, Stena, UL93, 9. 6. 1990, A. & M. Gogala leg.
Brje pri Komnu, VL07, 1. 7. 1990, A. & M. Gogala leg.
Zazid, Lipnik, 800 m, VL13, 17. 6. 2000, A. Gogala leg.
Ljubljana, Črnuče, Jarški prod, VM60, 23. 6. 2004, A. Gogala leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.
Kozina, VL15, 22. 6. 1991, V. Furlan leg.
Hrpelje, Prešnica, VL14, 13. 7. 1998, 7. 6. 1999, S. Brelih leg.
Nanos: Šembijska bajta, 800 m, VL27, 14. 7. 1999, S. Brelih leg.
Hrpelje, VL15, 24. 6. 1999, S. Brelih leg.
Additional record: Kamniško-Savinjske Alpe: Logarska dolina, 700 – 1100 m, VM74, 21. – 24. 6. 2005, J. Kolibáč leg., P. Kment det.

Hoplomachus thunbergii (Fallén, 1807)
Montandon, 1886: Gorica; A. Gogala, 1996
Specimens examined:
Ljubljansko barje: Log, Lukovica, VL59, 8. 6. 1991 on *Hieracium*, A. Gogala leg.
Vinje pri Moravčah, VM71, 23. 5. 1997, A. Gogala leg.
Ig, Škrilje, Stražar, 720 m, VL68, 9. 6. 1999, A. & M. Gogala leg.
Polhograjsko hrib.: Topol, Sv. Katarina, VM50, 7. 7. 1991, V. Furlan leg.

Icodema infuscata (Fieber, 1861)
Reuter, 1888: Gorica
Specimens examined:
Ig, Škrilje, Stražar, VL68, 30. 5. 2000, 1. 6. 2000, 5. 6. 2000, A. & M. Gogala leg.

Litoxenus tenellus Reuter, 1885
A. Gogala, 2002
Specimen examined:
Kraški rob: Zazid, Lipnik, VL13, 5. 6. 2001, A. Gogala leg.

Lopus decolor (Fallén, 1807)
Gogala & Gogala, 1986
Specimens examined:
Laibach (= Ljubljana), 24. 7. 1944, Staudacher leg.
Ljubljansko barje: Log, Lukovica, VL59, 11. 7. 1981, A. & M. Gogala leg.
Snežnik, VL54, 22. 7. 1992, A. & M. Gogala leg.

Macrotylus atricapillus (Scott, 1872)
Specimens examined:
Ankaran, VL04, 8. 6. 1983, A. & M. Gogala leg.
Sečovlje, Fontanigge, UL93, 18. 9. 2003, A. Gogala leg.

Macrotylus paykullii (Fallén, 1807)
Specimen examined:
Senovo, Reštanj, WL39, 1. 8. 1996, A. & M. Gogala leg.

Macrotylus solitarius (Meyer-Dür, 1843)
Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 27. 7. – 4. 8. 1979, BIJH SAZU leg.
Poljčane, Makole, WM53, 20. 7. 1984, MRT leg.
Kum, WM00, 26. 7. 1996, A. & M. Gogala leg.

Macrotylus herrichi (Reuter, 1873)
Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Kras: Štorje, VL16, 22. 7. 1980, A. & M. Gogala leg.
Dol na Kolpi, WL03, 1. – 5. 6. 1979, BIJH SAZU leg.
Kočevje, VL85, 6. – 14. 6. 1979, BIJH SAZU leg.
Kraški rob: Črni kal, VL14, 28. 6. 1980, A. & M. Gogala leg.
Rakitna, VL58, 28. 6. 1981, 31. 7. 1984, A. & M. Gogala leg.
Bloke: Nova vas, VL67, 28. 6. 1981, A. & M. Gogala leg.
Istra: Padna, UL93, 16. 6. 1984, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Ig, Škrilje, VL68, 8. 6. 1997, S. Brelih leg.
Gotenica, VL85, 4. 7. 1997, S. Brelih leg.
Obrov, Golac, VL24, 10. 6. 1999, S. Brelih leg.
Hrpelje, VL15, 24. 6. 1999, S. Brelih leg.

Macrotylus quadrilineatus (Schrank, 1785)
Gogala & Moder, 1960: Črna prst, Bohinj; Gogala & Gogala, 1986
Specimens examined:
Bohinj: Ukanc, VM02, 10. 9. 1978, 16. 8. 1981, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 6. 9. 1980 on *Salvia glutinosa*, A. & M. Gogala leg.
Grosuplje, Polica, VL79, 27. 9. 1980, A. & M. Gogala leg.
Grosuplje, Velike Lipljene, VL78, 30. 8. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 12. 9. 1982, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 14. 9. 1990, A. & M. Gogala leg.
Ig, Iška, Part. boln. Krvavica, VL68, 6. 9. 1999, A. Gogala leg.
Cerkniško jezero: Dolenja vas, VL47, 21. 8. 1997, S. Brelih leg.

Megalocoleus dissimilis (Reuter, 1876)
Montandon, 1886: Gorica

Megalodactylus macularubra (Mulsant & Rey, 1852)
Specimens examined:
Istra: Koper, Bertoki, Škocjanski zatok, VL04, 23. 5. 2000, 10. 6. 2000, on *Tamarix*, A. Gogala leg.

Monosynamma bohemanni (Fallén, 1829)
Montandon, 1886: Gorica; Gogala & Moder, 1960; Gogala & Gogala, 1986, 1989
Specimens examined:
Medvode, Sora, Draga, VM51, 22. 7. 1982, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje Jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Planinsko polje: Grčarevec, VL48, 22. 7. 1987 on *Salix*, A. & M. Gogala leg.
Bohinjska Bistrica, Nomenj, Lepence, VM22, 7. 7. 1988, V. Furlan leg.
Kresnice, Pogonik, VM80, 17. 7. 1988, V. Furlan leg.
Tolmin, Tolminka, VM01, 23. 7. 1989, V. Furlan leg.
Bovec, Žaga, UM83, 23. 7. 1989, V. Furlan leg.
Additional record: Litija, Zg. Hotič, VM80, 4. – 5. 7. 1999, Z. Malinka leg., P. Kment det.

Oncotylus punctipes Reuter, 1875
Gogala & Gogala, 1986
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.

Oncotylus viridiflavus (Goeze, 1778)
Gogala & Gogala, 1986
Specimens examined:
Bela krajina: Damelj, WL13, 11. 7. 1974, M. Štangelj leg.
Bela krajina: Sinji vrh, WL13, 31. 7. 1974, M. Štangelj leg.

Orthonotus cylindricollis (A. Costa, 1853)
Gogala & Gogala, 1989
Specimen examined:
Prekmurje: Petišovci, XM15, 13. 6. 1987, A. & M. Gogala leg.

Orthonotus rufifrons (Fallén, 1807)
Gogala & Gogala, 1986
Specimens examined:
Ljubljansko barje: Vrhnika, Bistra, VL48, 18. 6. 1978, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Log, Lukovica, VL59, 11. 7. 1990, A. & M. Gogala leg.

Phoenicocoris modestus (Meyer-Dür, 1843)
Gogala & Gogala, 1989
Specimens examined:
Goričko: Martinje, WM88, 14. 6. 1987 on *Pinus*, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 30. 5. 2000, 1. 6. 2000 on *Pinus*, A. & M. Gogala leg.

Phoenicocoris obscurellus (Fallén, 1829)
Gogala & Gogala, 1989
Specimens examined:
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987 on *Pinus*, A. & M. Gogala leg.

Phylus coryli (Linnaeus, 1758)
? *Cimex flavipes* Scopoli, 1763
Scopoli, 1763 (?); Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 19. 6. 1977, 9. 7. 1978, A. & M. Gogala leg.
Bohinjska Bistrica, VM12, 17. 6. 1979, A. & M. Gogala leg.
Ljubljansko barje: Ig, Kremenica, VL68, 6. 6. 1976, S. Brelih leg.
Slavnik, VL14, 2. 7. 1982, A. & M. Gogala leg.
Rovte, VL39, 22. 7. 1983, A. & M. Gogala leg.
Rakitna, VL58, 31. 7. 1984 on *Corylus*, A. & M. Gogala leg.
Krka, VL88, 12. 8. 1984, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987 on *Corylus*, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.
Podsreda, Trebča Gorca, WM40, 9. 7. 1998, S. Brelih leg.

Phylus melanocephalus (Linnaeus, 1767)
Gogala & Gogala, 1986
Specimens examined:
Laibach (= Ljubljana), 15. 6. 1944, Staudacher leg.
Ljubljana: Šiška, VM50, 22. 6. 1979, A. Gogala leg.
Ljubljana: Šentvid, VM50, 22. 6. 1980, A. & M. Gogala leg.
Kras: Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Hrastnik, Krnice, WM00, 26. 5. 1997, M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 1. 6. 2000, A. & M. Gogala leg.

Phylus plagiatus (Herrich-Schaeffer, 1835)
Fieber, 1861: Krain; Gogala & Gogala, 1986
Specimen examined:
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.

Placochilus seladonicus (Fallén, 1807)
Montandon, 1886: Gorica; Gogala & Gogala, 1986, 1989, 1994
Specimens examined:
Prekmurje: Moravci, WM97, 5. 7. 1980, A. & M. Gogala leg.
Vrhnika, VL49, 11. 7. 1982, A. & M. Gogala leg.
Ilirska Bistrica, Jelšane, VL43, 21. 6. 1983, M. Gogala leg.

Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Kras: Brje pri Komnu, VL07, 18. 6. 1989, 24. 6. 2005 on *Knautia*, A. Gogala leg.
Kraški rob: Črnotiče, VL14, 8. 7. 1990, A. & M. Gogala leg.
Nanos: Sv. Hieronim, VL27, 25. 7. 1992, A. & M. Gogala leg.
Kum, WM00, 26. 7. 1996, A. & M. Gogala leg.
Hrastnik, Krnice, WM00, 26. 5. 1997, M. Gogala leg.
Zazid, Lipnik, 700 m, VL13, 17. 6. 2000, A. Gogala leg.
Novo mesto, Trška gora, WL17, 21. – 22. 5. 1983, V. Furlan leg.
Hrpelje, Podgorje, VL14, 13. 7. 1998, S. Brelih leg.
Additional record: Kamniško-Savinjske Alpe: Logarska dolina, 700 – 1100 m, VM74, 21. – 24. 6. 2005, J. Kolibáč leg., P. Kment det.

Plagiognathus arbustorum (Fabricius, 1794)
Gogala & Moder, 1960: Trenta: Pl. Trebiščna; Gogala & Gogala, 1986, 1989
Specimens examined:
Ljubljana: Šiška, VM50, 20. 6. 1979, A. & M. Gogala leg.
Medvode, Goričane, VM51, 15. 7. 1980, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 3. 7. 1981 on *Triticum*, A. & M. Gogala leg.
Medvode, Medno, VM50, 5. 7. 1981, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982 on *Urtica*, A. & M. Gogala leg.
Ljubljana: Tomačevo, VM60, 14. 6. 1983, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Pohorje: Areh, WM35, 24. 7. 1983, A. & M. Gogala leg.
Jezersko, VM64, 14. 8. 1983, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 4. 8. 1984 on *Aconitum*, A. & M. Gogala leg.
Radlje ob Dravi, WM16, 22. 8. 1984, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Zg. Radovna, VM14, 28. 8. 1988, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Gradišče pri Lukovici, VM71, 11. 7. 1996, A. Gogala leg.
Kočevje, Dolga vas, VL95, 4. 7. 1997, S. Brelih leg.
Bavšica, UM93, 22. 7. 2000, S. Brelih leg.

Plagiognathus chrysanthemi (Wolff, 1804)
Plagiognathus cunctator Horváth, 1887
Montandon, 1886: Gorica; Horváth, 1887: Gorica (type locality of *P. cunctator);* Gogala & Moder, 1960: Ljubljansko barje; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinj: Ukanc, VM02, 3. 7. 1977, 9. 8. 1978, A. & M. Gogala leg.
Medvode, Goričane, VM51, 15. 7. 1980, A. & M. Gogala leg.
Bloke: Nova vas, VL67, 28. 6. 1981, A. & M. Gogala leg.
Borovnica, Pokojišče, VL48, 7. 9. 1981, A. & M. Gogala leg.
Kamnik pod Krimom, Ponikve, VL58, 20. 6. 1982, A. & M. Gogala leg.
Bovec, UM83, 17. 7. 1982, A. & M. Gogala leg.
Cerkniško jezero: Cerknica, Dolenje jezero, VL56, 29. 6. 1983, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 4. 8. 1983, A. & M. Gogala leg.
Brkini: Artviže, VL25, 28. 7. 1984, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Planina, Planinsko polje, VL47, 21. 6. 2000, A. Gogala leg.
Pivka, Slovenska vas, Petelinjsko jezero, VL46, 24. 7. 2001, A. Gogala leg.
Gotenica, 600 m, VL85, 4. 7. 1997, S. Brelih leg.
Nanos: Šembijska bajta, 800 m, VL27, 14. 7. 1999, S. Brelih leg.
Julijske Alpe: Vas na skali, VM03, 21. 7. 2000, S. Brelih leg.

Plagiognathus fulvipennis (Kirschbaum, 1856)
Horváth, 1887: Gorica; Gogala & Gogala, 1986
Specimens examined:
Istra: Koper, Škocjanski zatok, VL04, 1. 7. 1979, A. & M. Gogala leg.
Bohinj: Ukanc, VM02, 24. 7. 1979, A. & M. Gogala leg.
Prekmurje: Filovci, XM06, 4. 7. 1980, A. & M. Gogala leg.

Plagiognathus vitellinus (Scholtz, 1847)
Gogala & Gogala, 1986, 1989; Floren & Gogala, 2002: Kočevski Rog, Baza 20, on *Abies alba*
Specimens examined:
Ljubljana: Šiška, VM50, 15. 7. 1980, A. Gogala leg.
Rakitna, VL58, 31. 7. 1984 on *Picea*, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, Pasja ravan, VM40, 15. 8. 1984, A. & M. Gogala leg.
Horjul, Lesno brdo, VL49, 8. 6. 1986 on *Larix*, A. & M. Gogala leg.

Plesiodema pinetella (Zetterstedt, 1828)
Gogala & Gogala, 1989
Specimens examined:
Goričko: Martinje, WM88, 14. 6. 1987 on *Pinus*, A. & M. Gogala leg.
Bloke: Volčje, Bloško jezero, VL67, 11. 7. 1987, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 30. 5. 2000 on *Pinus*, A. & M. Gogala leg.

Psallus betuleti (Fallén, 1826)
Gogala & Gogala, 1986
Specimen examined:
Kočevje, VL85, 6. – 14. 6. 1979, BIJH SAZU leg.

Psallus perrisi (Mulsant & Rey, 1852)
Gogala & Gogala, 1986, 1989 (confused with *P. variabilis* and *P. wagneri),* 1994
Specimens examined:
Istra: Sočerga, Veli Badin, VL13, 18. 5. 1990, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983 on *Quercus*, A. & M. Gogala leg.
Kras: Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.

Kraški rob: Podpeč, VL14, 22. 6. 1991, A. & M. Gogala leg.
Brje pri Komnu, VL07, 28. 5. 2000, A. Gogala leg.

Psallus variabilis (Fallén, 1807)
Montandon, 1886: Gorica
Specimens examined:
Prekmurje: Gomilica, WM06, 13. 6. 1987, A. & M. Gogala leg.
Korovci, WM77, 14. 6. 1987, A. & M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 31. 5. 1987, A. & M. Gogala leg.
Prekmurje: Benica, Murska šuma, XM15, 22. 5. 2001, A. Gogala leg.
Rakov Škocjan, VL47, 17. 6. 2005 on *Corylus*, A. Gogala leg.

Psallus wagneri Ossiannilsson, 1953
Specimens examined:
Janče, VM70, 7. 6. 1981, A. & M. Gogala leg.
Kočevje, VL85, 6. – 14. 6. 1979, 20. – 28. 7. 1979, BIJH SAZU leg.
Kras: Brje pri Komnu, VL07, 3. 6. 2001, A. Gogala leg.

Psallus ambiguus (Fallén, 1807)
Gogala & Gogala, 1986, 1989; Floren & Gogala, 2002: Kočevski Rog, Baza 20, on *Fagus sylvatica*
Specimens examined:
Dobrova, VM50, 27. 5. 1979, A. & M. Gogala leg.
Janče, VM70, 7. 6. 1981, A. & M. Gogala leg.
Laško, Šmohor, WM11, 13. 7. 1984 on *Tilia*, A. & M. Gogala leg.
Prekmurje: Gomilica, WM06, 13. 6. 1987, A. & M. Gogala leg.
Goričko: Ocinje, WM78, 14. 6. 1987, A. & M. Gogala leg.
Ljubljansko barje: Log, Lukovica, VL59, 21. 6. 1987 on *Malus*, A. & M. Gogala leg.
Logarska dolina, VM74, 25. 6. 1988, A. & M. Gogala leg.
Hrastnik, Krnice, WM00, 26. 5. 1997, M. Gogala leg.
Ig, Škrilje, Stražar, 720 m, VL68, 14. 6. 1999, A. & M. Gogala leg.
Ig, Iška, VL68, 10. 6. 2005 on *Salix*, A. Gogala leg.
Rakov Škocjan, VL47, 17. 6. 2005 on *Corylus*, A. Gogala leg.
Obrov, Golac, VL24, 10. 6. 1999, S. Brelih leg.

Psallus henschii Reuter, 1888
Reuter, 1888: Gorica (type locality); Gogala & Gogala, 1989, 1994
Specimens examined:
Kraški rob: Črni kal, VL14, 7. 6. 1987, A. & M. Gogala leg.
Istra: Zazid, 380 m, VL14, 26. 5. 2003, S. Brelih leg.

Psallus nigripilis (Reuter, 1888)
Specimens examined:
Kras: Brje pri Komnu, VL07, 3. 6. 2001 on *Quercus*, A. Gogala leg.

Psallus quercus (Kirschbaum, 1856)
Montandon, 1886: Gorica (possibly confused with related species)

Psallus pinicola Reuter, 1875
Gogala & Gogala, 1989
Specimens examined:
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Pohorje: Lovrenška jezera, WM24, 23. 8. 1987, A. & M. Gogala leg.

Psallus vittatus (Fieber, 1861)
Gogala & Moder, 1960: Trigl. jezera; Gogala & Gogala, 1986, 1989
Specimens examined:
Bohinjska Bistrica, Nemški rovt, VM22, 25. 7. 1979, 24. 8. 1980, 15. 8. 1981, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.

Psallus anaemicus Seidenstücker, 1966
Specimens examined:
Kraški rob: Črni kal, VL14, 7. 6. 1987, A. & M. Gogala leg.
Ig, Škrilje, Stražar, 720 m, VL68, 14. 6. 1999, A. & M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.
Kras: Veliki Dol, VL07, 27. 5. 2001 on *Quercus*, A. Gogala leg.

Psallus cruentatus (Mulsant & Rey, 1852)
A. Gogala, 1996
Specimens examined:
Štorje, VL16, 8. 6. 1983, A. & M. Gogala leg.
Sežana, Povir, VL16, 8. 6. 1983, A. & M. Gogala leg.
Prekmurje: Benica, Murska šuma, XM15, 22. 5. 2001, A. Gogala leg.
Kras: Veliki Dol, VL07, 27. 5. 2001 on *Quercus*, A. Gogala leg.

Psallus flavellus Stichel, 1933
Gogala & Gogala, 1989
Specimen examined:
Prekmurje: Gomilica, XM06, 13. 6. 1987 on *Fraxinus*, A. & M. Gogala leg.

Psallus haematodes (Gmelin, 1790)
Psallus alni (Fabricius, 1794)
Gogala & Gogala, 1986
Specimens examined:
Bloke: Volčje, Bloško jezero, VL67, 7. 8. 1983 on *Salix*, A. & M. Gogala leg.
Polhograjsko hrib.: Črni vrh, VM40, 10. 8. 1983 on *Salix*, A. & M. Gogala leg.

Psallus lentigo Seidenstücker, 1972
Specimens examined:
Ig, Škrilje, Stražar, VL68, 15. 5. 2000 on *Quercus*, 30. 5. 2000, 1. 6. 2000, A. & M. Gogala leg.

Psallus lepidus Fieber, 1858
Montandon, 1886: Gorica

Psallus lucanicus Wagner, 1968
Psallus balcanicus Josifov, 1969

Gogala & Gogala, 1986
Specimens examined:
Dol na Kolpi, WL03, 1. – 5. 6. 1979, BIJH SAZU leg.
Ig, Škrilje, Stražar, VL68, 15. 5. 2000 on *Quercus*, 30. 5. 2000, 5. 6. 2000, A. & M. Gogala leg.

Psallus mollis (Mulsant & Rey, 1852)
Gogala & Gogala, 1986
Specimens examined:
Kočevje, VL85, 20. – 28. 7. 1979, BIJH SAZU leg.
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.

Psallus pardalis Seidenstücker, 1966
Specimens examined:
Ig, Škrilje, Stražar, VL68, 5. 6. 2000, A. & M. Gogala leg.

Psallus salicis (Kirschbaum, 1856)
Specimens examined:
Gradišče pri Lukovici, VM71, 31. 7. 1996 on *Alnus*, A. & M. Gogala leg.

Psallus varians (Herrich-Schaeffer, 1841)
Floren & Gogala, 2002
Psallus varians varians (Herrich-Schaeffer, 1841)
Specimens examined:
Kamniško-Savinjske Alpe: Okrešelj, VM63, 25. 6. 1988, A. & M. Gogala leg.
Log, Lukovica, VL59, 2. 6. 1998, M. Gogala leg.
Ljubljansko barje: Notranje Gorice, VL59, 31. 5. 1987, A. & M. Gogala leg.
Vuhred, Hudi kot, WM15, 2. 6. 1986, M. Gogala leg.
Ig, Škrilje, Stražar, VL68, 15. 5. 2000, A. & M. Gogala leg.
Kočevski Rog, Baza 20, 900 m, WL06, 25. 6. 1999, 26. 6. 1999, on *Fagus sylvatica*, A. Floren leg.
Banja loka, Stružnica, VL83, 24. 5. 2001, S. Brelih leg.
Psallus varians cornutus Wagner, 1943
Specimens examined:
Istra: Sočerga, Veli Badin, VL13, 20. 5. 2001 on *Quercus ilex*, A. Gogala leg.

Tinicephalus hortulanus (Meyer-Dür, 1843)
Reuter, 1884: Carniolia; Horváth, 1887: Gorica; Gogala & Gogala, 1986, 1989
Specimens examined:
Ig, Kurešček, VL68, 21. 6. 1980 on *Helianthemum*, A. & M. Gogala leg.
Slavnik, VL14, 2. 7. 1982 on *Helianthemum*, A. & M. Gogala leg.
Istra: Koštabona, VL03, 7. 6. 1987, A. & M. Gogala leg.
Uršlja gora: Plešivec, VM94, 22. 8. 1987, A. & M. Gogala leg.
Julijske Alpe: Studorski preval – Vodnikova koča, VM13, 13. 9. 1987, A. & M. Gogala leg.
Krnska jezera, UM92, 31. 7. 1988, A. & M. Gogala leg.
Tosc, 1800 m, VM13, 6. 8. 1991, A. & M. Gogala leg.
Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, A. & M. Gogala leg.
Kraški rob: Zazid, Lipnik, VL13, 5. 6. 2001, A. Gogala leg.

Tuponia hippophaes (Fieber, 1861)
Gogala & Gogala, 1986
Specimens examined:
Istra: Strunjan, UL94, 22. 9. 1982 on *Tamarix*, A. & M. Gogala leg.
Koper, Bertoki, Škocjanski zatok, VL04, 10. 6. 2000 on *Tamarix*, A. Gogala leg.

Tuponia mixticolor (A. Costa, 1862)
Specimens examined:
Istra: Koper, Bertoki, Škocjanski zatok, VL04, 23. 5. 2000, 10. 6. 2000 on *Tamarix*, A. Gogala leg.

Species omitted from the list

Deraeocoris punctulatus (Fallén, 1807)
Gogala & Moder, 1960: Strunjan. This locality at the Adriatic coast is populated by the closely related *D. serenus*. It is unlikely for the Eurosiberian *D. punctulatus* to live there.

Phytocoris exoletus A. Costa, 1853
Gogala & Moder, 1960: Golnik. The record of this west Mediterranean species in the Alps is doubtful and needs confirmation.

Halticus puncticollis Fieber, 1870
Montandon, 1886: Gorica; A. Gogala, 1996. See the note by *Halticus henschii* Reuter, 1888.

Orthotylus concolor (Kirschbaum, 1856)
Gogala & Gogala, 1989. Misidentification – record refers to *O. virescens*.

Europiella albipennis (Fallén, 1829)
Plagiognathus arenicola Wagner, 1941
Gogala & Gogala, 1994. Misidentification – record refers to *E. artemisiae*.

Macrotylus nasutus Wagner, 1959
Gogala & Gogala, 1986; A. Gogala, 1992. Misidentification – records refer to *M. atricapillus*.

Psallus falleni Reuter, 1883
Gogala & Gogala, 1989. Misidentification – record refers to *P. varians*.

DISCUSSION

260 species of plant bugs (Miridae) from the territory of Slovenia are listed. 20 species are reported for Slovenia for the first time: *Dicyphus albonasutus* Wagner, 1951, *Dicyphus stachydis wagneri* Tamanini, 1956, *Deraeocoris flavilinea* (A. Costa, 1862), *Phytocoris austriacus* Wagner, 1954, *Polymerus microphthalmus* (Wagner, 1951), *Strongylocoris steganoides* (J. Sahlberg, 1875), *Globiceps novaki* Wagner, 1950, *Orthotylus rubidus* (Puton, 1874), *Orthotylus tenellus* (Fallén, 1807), *Hypseloecus visci* (Puton, 1888), *Europiella decolor* (Uhler, 1893), *Macrotylus atricapillus* (Scott, 1872), *Macrotylus paykullii* (Fallén, 1807), *Megalodactylus macularubra* (Mulsant & Rey, 1852), *Psallus wagneri* Ossiannilsson, 1953, *Psallus nigripilis* (Reuter, 1888),

Psallus anaemicus Seidenstücker, 1966, *Psallus lentigo* Seidenstücker, 1972, *Psallus pardalis* Seidenstücker, 1966, and *Psallus salicis* (Kirschbaum, 1856), as well as the subspecies *Psallus varians cornutus* Wagner, 1943. The first reliable record of *Lygus punctatus* (Zetterstedt, 1838) is also reported.

Several of the newly recorded species have been recognized after reexaminations of the museum collections. Many *Psallus* species, however, were discovered in a single locality in the Dinaric mountains south of the Ljubljana basin, together with rarely found *Dryophilocoris luteus* and *Icodema infuscata*. They were beaten from oak trees, but many specimens were also attracted to light lure shortly after sunset. This is a good illustration of a high potential for improved knowledge of the fauna when right collecting methods are used systematically. Many more species are expected to be found in Slovenia.

7 species, reported for Slovenia in different works, are omitted from the list due to proved or suspected misidentifications. The presence of some other species, recorded only once in the literature, also needs confirmation.

The lectotype of *Dimorphocoris schmidti* (Fieber, 1858) is designated. The specimen is preserved in the Slovenian Museum of Natural History (Ljubljana), in the collection of F. J. Schmidt, who collected the type material from which F. X. Fieber described the species. The specimen is labelled differently than other specimens from Schmidt's collection. A small green square paper likely indicates that it came from Fieber's collection, like the material in the collections of Noualhier and Puton (preserved in MNHN in Paris), from which several lectotypes were designated by Kerzhner & Matocq (1994).

Dimorphocoris saulii Wagner, 1965 and *Platycranus boreae* Gogala, 2002 are two endemic species, known from a single locality in the Karst (Vremščica) or karst Istrian (Lipnik) mountains. They would be endangered by the development in their habitats or by afforestation of the grasslands. The third endemic species, *Halticus henschii* Reuter, 1888, populates same habitats as the other two, but is distributed wider.

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HETEROPTERA SLOVENIJE, III: MIRIDAE

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POVZETEK

Zabeleženih je 260 vrst travniških stenic (Miridae) iz Slovenije. Prvič so objavljene najdbe 20 vrst in ene podvrste: Dicyphus albonasutus *Wagner, 1951,* Dicyphus stachydis wagneri *Tamanini, 1956,* Deraeocoris flavilinea *(A. Costa, 1862),* Phytocoris austriacus *Wagner, 1954,* Polymerus microphthalmus (*Wagner, 1951),* Strongylocoris steganoides *(J. Sahlberg, 1875),* Globiceps novaki *Wagner, 1950,* Orthotylus rubidus *(Puton, 1874),* Orthotylus tenellus *(Fallén, 1807),* Hypseloecus visci *(Puton, 1888),* Europiella decolor *(Uhler, 1893),* Macrotylus atricapillus *(Scott, 1872),* Macrotylus paykullii *(Fallén, 1807),* Megalodactylus macularubra *(Mulsant & Rey, 1852),* Psallus wagneri *Ossiannilsson, 1953,* Psallus nigripilis *(Reuter, 1888),* Psallus anaemicus *Seidenstücker, 1966,* Psallus lentigo *Seidenstücker, 1972,* Psallus pardalis *Seidenstücker, 1966,* Psallus salicis *(Kirschbaum, 1856) in* Psallus varians cornutus *Wagner, 1943. Objavljena je tudi prva zanesljiva najdba vrste* Lygus punctatus *(Zetterstedt, 1838). 7 vrst je izločenih iz seznama zaradi napačnih določitev v preteklosti. Določen je lektotip vrste* Dimorphocoris schmidti *(Fieber, 1858).*

Ključne besede: Heteroptera, Cimicomorpha, Miridae, Slovenija, favna

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VPLIV DIMENZIJ SESTAVE TELESA NA AEROBNO UČINKOVITOST OTROK

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IZVLEČEK

Namen študije je bil ugotoviti vpliv dimenzij telesne sestave na VO_{2max} in posamezne komponente aerobne učinkovitosti otrok, starih med 10 in 14 leti. Vzorec preiskovancev je sestavljalo 28 otrok – 14 osnovnošolskih učencev in 14 učenk. Za potrebe študije smo vzorec otrok razdelili v dve starostni skupini. V prvi je bilo 12 otrok (starost 10,7 ± 0,4 leta), v drugi pa 16 otrok (starost 14,2 ± 0,5 leta). Otroci niso bili trenirani. Preiskovanci so opravili antropometrijske meritve in test maksimalne aerobne moči na tekoči preprogi. Ugotovili smo, da so dimenzije telesne sestave (kostna masa-AKOS in mišična masa-AMIS) v visoki korelaciji (nad 0,80) z mehanizmi aerobne učinkovitosti (posebno srčno-žilne in ventilacijske dimenzije). Učinkovitost metaboličnih dimenzij aerobne funkcije in aerobno učinkovitost, izraženo v relativnih merah, izrazito znižuje masa maščobnega tkiva (AMAST).

Ključne besede: aerobna učinkovitost, sestava telesa, antropometrija, puberteta

INFLUSSO DELLE DIMENSIONI DELLA STRUTTURA CORPOREA SULL'EFFICIENZA AEROBICA DEI BAMBINI

SINTESI

Lo scopo dello studio era quello di accertare l'influsso delle dimensioni della struttura corporea su VO_{2max} e su singole componenti dell'efficienza aerobica di bambini di età compresa fra i 10 ed i 14 anni. Il campione studiato era composto da 28 bambini – 14 alunni e 14 alunne delle scuole elementari. Il campione è stato suddiviso in due classi d'età. La prima comprendeva 12 bambini (età 10,7 ± 0,4 anni), la seconda 16 bambini (età 14,2 ± 0,5 anni). I bambini non erano allenati e si sono sottoposti alle misurazioni antropometriche ed al test della forza aerobica massima su tappeto scorrevole. Gli autori hanno accertato che le dimensioni della struttura corporea (massa scheletrica-AKOS e massa muscolare-AMIS) presentano una correlazione alta (maggiore di 0,80) con i meccanismi dell'efficienza aerobica. La massa del tessuto adiposo (AMAST) chiaramente diminuisce l'efficienza delle dimensioni metaboliche della funzione aerobica e l'efficienza aerobica.

Parole chiave: efficienza aerobica, struttura corporea, antropometria, pubertà

UVOD

Največja količina kisika (VO_{2max}), ki jo lahko posameznik sprejme med fizičnim naporom, je najbolj uporaben in objektiven kriterij za merjenje aerobne učinkovitosti (Astrand & Rodahl, 1986; Willmore & Costill, 1994). VO_{2max} oziroma aerobna učinkovitost človeka je odvisna od ventilacijskih, srčno-žilnih in hematoloških dejavnikov, ki upravljajo transport kisika ter od oksidativnih mehanizmov v aktivnih mišicah (Armstrong & Welsman, 2000). VO_{2max} je funkcija srčnega dela (MVS) in arterio-venozne kisikove razlike (a-v razlika O_2).[1]

Najpomembnejša značilnost odraščanja je proces sprememb. Zaznamujeta ga rast, ki pomeni kvantitativne spremembe, in zorenje, ki ga določajo kvalitativne spremembe v organizmu. Tudi na aerobno in s tem vzdržljivostno učinkovitost otroka v odraščanju vplivajo spremembe obeh vrst.

Razvoj številnih funkcij aerobne učinkovitosti, ki so neposredno odvisne od volumna srca, velikosti pljuč, količine krvne plazme ali hemoglobina, je vzporeden s procesom rasti. Čeprav se (timing – začetek in časovni potek) in (tempo) rasti razlikujeta od posameznika do posameznika, se telesna masa fantov med 8. in 16. letom poveča za 60%, deklet pa za 125%. Telesna višina se v tem obdobju poveča za 40% oziroma 30% (Armstrong & Welshman, 1994, 2000). Vzporedno s spremembami zunanjih telesnih mer se spreminja tudi struktura telesa. Dogajajo se kvalitativne spremembe v posameznih organskih sistemih, ki vplivajo tudi na posamezne mehanizme aerobne učinkovitosti otrok in mladine. Tako masa kot relativni deleži mišičnega in kostnega tkiva se v obdobju otroštva in adolescence povečujejo. Pri fantih ta proces teče do starosti 18 do 20 let, pri dekletih pa se naraščanje mišične in kostne mase zaključi 4 do 5 let prej. Delež maščobnega tkiva pri dekletih narašča skozi celotno obdobje adolescence, pri fantih pa po dvigu v zgodnjem obdobju adolescence kasneje postopno upada (Malina & Bouchard, 1992; Rowland, 1996).

S spreminjanjem vsebnosti vode, mineralov in proteinov se ne spreminja le kemična struktura posameznih tkiv, temveč tudi njihova funkcionalnost. Zelo pomemben prispevek k spremembi aerobne učinkovitosti človeka v obdobju adolescence imajo hormonske spremembe (spolnih hormoni, kateholamini), ki so še zlasti v tem obdobju posebej velike (Bitar *et al.*, 2000). Tako se VO_{2max} pri fantih od 8. do 16. leta poveča za 150%, pri dekletih pa za 80% (Armstrong *et al.*, 1991). Fantje imajo rel. VO_{2max} enak kot mladi moški. Pri dekletih pa se rel. VO_{2max} zmanjšuje od pubertete do odraslosti (Meen, 2000). Po mnenju Pettersena *et al.* (2001) je povečanje podkožne maščobe, pri dekletih v obdobju pubertete, po vsej verjetnosti razlog, da se proporcionalno telesna masa povečuje bolj kot VO_{2max}.

Ugotovitve kažejo, da med normalno rastjo in razvojem na povečanje aerobne učinkovitosti vpliva izboljšanje maksimalne frekvence srca (McCann, 2004). Raziskava Janza in Mahoneya (1997) kaže, da pri fantih, starih od 7 do 12 let, povečanje mišične mase in povečanje mase levega ventrikla pojasni 51% variabilnosti aerobne učinkovitosti. Povečanje mišične mase in telesne višine pri enako starih dekletih pojasni 26% variabilnosti aerobne učinkovitosti. Med puberteto se otrokom, ki pridobijo veliko količino mišične mase (vključno s srčno), izredno izboljša absolutna aerobna učinkovitost (VO_{2max}). Ugotovitve Gorana *et al.* (2000) prikazujejo, da ima mišična masa največji vpliv na VO_{2max} (ml/min), da pa maščobna masa nima nobenega vpliva na VO_{2max} (ml/min). Maščobna masa in odvečna telesna teža ne nakazujeta na zmanjšano sposobnost maksimalne aerobne učinkovitosti, ampak bolj na to, da ima odvečna maščoba škodljiv učinek na sub-maksimalno aerobno učinkovitost. Raziskava Vsetulove in Bunca (2004) potrjuje, da delež maščobnega tkiva pri debelih ženskah (40,8–58,8% maščobnega tkiva), starih od 25 do 54 let, ne vpliva na relativno VO_{2max}.

V naši raziskavi smo želeli ugotoviti vpliv dimenzij telesne sestave na aerobno učinkovitost otrok med 10 in 14 leti. Ugotoviti smo želeli, katere dimenzije telesne sestave, kot so telesna višina, telesna teža, mišična masa, maščobno tkivo in kostno tkivo, najbolje napovedujejo dinamiko aerobne učinkovitosti pri otrocih v začetnem obdobju adolescence.

METODE DELA

Vzorec preiskovancev

Vzorec preiskovancev je sestavljalo 28 naključno izbranih osnovnošolskih otrok – 14 učencev in 14 učenk. Povprečna starost merjencev je bila 12,7 ± 1,8 leta. Otroci niso bili trenirani, ampak so bili vključeni v različne športne dejavnosti v šoli. Za potrebe študije smo vzorec otrok razdelili v dve starostni skupini. V mlajši starostni skupini je bilo 12 otrok (starost: 10,7 ± 0,4 leta), v starejši pa 16 otrok (starost: 14,2 ± 0,5 leta). Vsi so bili natančno seznanjeni z namenom raziskave, s protokolom merjenj, obveznostmi in morebitnimi posledicami meritev. Prav tako smo namen raziskave, celoten merski postopek, obveznosti otrok in morebitne posledice meritev predstavili pisno, na sestanku pa tudi vsem staršem v raziskavo vključenih otrok. Pisno privoljenje k sodelovanje v meritvah so dali tako otroci kot njihovi starši. Soglasje k tej fazi raziskave in merskim postopkom je dala tudi Medicinska etična komisija.

1 MVS = UV [ml krvi/utrip] (utripni volumen) × HR [utrip/min] (frekvenca srca); VO_{2max} [l/min] = MVS [l krvi/min] × a-v razlika O_2 [ml O_2/100 ml krvi]

Eksperimentalni postopek

Preiskovanci so opravili antropometrijske meritve in test maksimalne aerobne moči na tekoči preprogi.

Antropometrične meritve – Sestava telesa

Telesna masa (AT) in višina (AV) sta bili izmerjeni z 0,1 kg oz. 0,1 cm natančnosti. Mišična masa (AMIS) je bila izračunana (enačbi 1 in 2) na osnovi obsegov in kožnih gub (KG) na: nadlahti, podlahti, stegnu in mečih (Matiegka, 1921).

Kostna masa (AKOS) je bila izračunana (enačba 3) na osnovi premera nadlahtnice (APKOM), premera zapestja (APZ), premera kolena (APKOL) in premere gležnja (APG) (Matiegka, 1921).

Masa maščobnega tkiva (AMAST) je bila izračunana (enačbe 4, 5, 6) na osnovi kožnih gub: bicepsa (AKGB), podlahti (AKGP), stegna (AKGS), meč (AKGM), na prsih (AKGPR), na trebuhu (AKGT) in telesne površine (TP), mase (AT) in višine (AV) (Matiegka, 1921).

(enačba 1)

$$AMIS\ (kg) = 0{,}0065 \times BH \times r^2$$

(enačba 2)

$$r = (AON+AOP+AOS+AOM) \times 25{,}12^{-1} - (AKGB+AKGP+AKGS+AKGM) \times 8^{-1}$$

(enačba 3)

$$AKOS = (APKOM+APZ+APKOL+APG)/4 \times AV \times 1{,}2$$

(enačba 4)

$$AMAST = 0{,}13 \times d \times TP$$

(enačba 5)

$$TP = 0{,}01672 \times AT^{-2} \times AV^{-2}$$

(enačba 6)

$$d = (AKGB + AKGS + AKGM + AKGPR + AKGT)/12$$

Test maksimalne aerobne moči

Aerobno moč otrok smo izmerili s testom s stopnjevano hitrostjo na tekoči preprogi pri 5% naklona (Bunc *et al.*,1987). Začetna hitrost teka je bila 8 km/h in se je povečevala vsako minuto za 1 km/h do hitrosti, ki jo je posameznik še zmogel. Pred testom je vsak opravil ogrevanje: 7 minut (3 min pri hitrosti 6 km/h in 4 min pri hitrosti 7 km/h brez naklona preproge) in 4 minute teka brez naklona pri hitrosti 8 km/h. Po končanem testu je sledila 3-minutna hoja za umiritev. Za analizo izdihanih plinov med testom je bila uporabljena prenosna telemetrijska enota K4b Cosmed (Italija) (sistem 'breath by breath'), ki je bila kalibrirana pred vsakim testom v skladu z navodili proizvajalca. Prednost prenosne telemetrijske naprave je v tem, da zaradi preproste uporabe (maska na obrazu meri izmenjavo plinov) in nizke teže (tehta samo 600g) omogoča opravljanje meritev med samo aktivnostjo na terenu oziroma v situacijskem okolju, kot tudi po standardnih protokolih v laboratoriju.

Preiskave in meritve

Opravljene so bile sledeče preiskave in meritve:

- merjenje respiratornih spremenljivk in variabel plinske izmenjave,
- merjenje koncentracije laktata v krvi in
- merjenje srčnega utripa.

Respiratorne spremenljivke in variable plinske izmenjave

Merjenje respiratornih spremenljivk in variabel plinske izmenjave je bilo opravljeno s pomočjo prenosne telemetrijske enote K4b Cosmed. Izmerjene so bile sledeče variable:

- frekvenca dihanja (FD)
- vdihni volumen (TV)
- največja ventilacija (Ve_{max})
- ekvivalent dihanja (Ve/VO_2)
- količina CO_2 v izdihanem zraku (VCO_{2max})
- poraba kisika (VO_{2max}) v absolutnih (l/min) in relativnih vrednostih (ml/min×kg)
- respiratorni kvocient (RER)
- kisikov pulz (O_2pulz).

Vse spremenljivke so bile merjene ves čas opravljanja testnega protokola.

Srčni utrip (HR)

Srčni utrip (HR) je bil spremljan s pomočjo merilnikov srčnega utripa Polar in telemetrijske enote Polar (Oulu, Finska).

Statistične metode

Izračunana je bila korelacija (Pearsonov r) med mehanizmi aerobne učinkovitosti in morfološkimi merami. Za ugotavljanje vpliva morfoloških dimenzij na aerobno učinkovitost otrok je bila uporabljena regresijska analiza (metoda Enter) in več-faktorska analiza kovariance. Statistična značilnost je bila sprejeta s 5% alfa-napako pri dvosmernem testiranju.

REZULTATI

Preiskovanci so bili visoki (AV) 159,8 ± 13,5 cm in imeli 49,7 ± 13,7 kg telesne mase (AT). Porazdelitev telesne mase (AT) je bilo sledeče: 23,3 kg (46,7%) mišične mase (AMIS), 13,2 kg (27,5%) kostne mase (AKOS) in 7,7 kg (15,1%) mase maščobnega tkiva (AMAST). V testu največje aerobne moči so dosegli abs.VO_{2max} 2,33 ± 0,78 l/min oziroma rel.VO_{2max} 47 ml/min/kg. Srčni utrip (HR) pri največjem naporu je bil 201,0 ± 6,9, frekvenca dihanja (FD) 60,0 ± 8,4 vdihov/min, ventilacija (Ve_{max}) 93,9 ± 26,0 l in respiratorni količnik (RER) 1,24 ± 0,16 (Tab. 1).

Tab. 1: Povezanost med dimenzijami aerobne učinkovitosti in spremenljivkami telesne sestave.
Tab. 1: Correlation between aerobic ability dimensions and body composition variables.

Parameter	AKOS	AMIS	AMAST	AT	AV
FD	-0,09	-0,17	0,12	0,08	-0,14
TV	**0,85**	**0,84**	0,33	**0,82**	**0,80**
Ve_{max}	**0,91**	**0,86**	**0,46**	**0,89**	**0,82**
abs. VO_{2max}	**0,91**	**0,84**	0,31	**0,85**	**0,81**
VCO_2	**0,94**	**0,89**	**0,39**	**0,89**	**0,88**
Ve/VO_2	-0,43	-0,35	0,19	-0,31	-0,41
rel. VO_{2max}	0,24	-0,02	**-0,53**	-0,01	0,09
PER	**0,51**	**0,56**	**0,42**	**0,54**	**0,60**
HR	0,14	0,15	0,12	0,12	0,25
O_2 pulz	**0,91**	**0,84**	0,32	**0,85**	**0,80**
del VO_2 LP	-0,36	-0,36	-0,04	-0,30	-0,34

Poudarjeni tisk pomeni statistično pomembnost korelacije.

Absolutna VO_{2max} je v visoki in statistično značilni povezanosti z AV, AT, AKOS in AMIS. Relativna VO_{2max} je v negativni povezanosti z AMAST, ni pa odvisna od starosti otrok in tudi ne od drugih dimenzij telesne zgradbe. Tako kot abs. VO_{2max} so tudi Ve, O_2 pulz in metabolični funkciji (VCO_2 in RER) srednje ali močno povezane z merami telesne sestave. FD in HR sta neodvisni od starosti in izbranih morfoloških dimenzij.

Tab. 2: Vpliv dimenzij telesne sestave na aerobno učinkovitost in na posameznemehanizme aerobne učinkovitosti.[2]
Tab. 2: The impact of body composition dimensions on aerobic ability and on separate mechanisms of aerobic capacity[2].

Odvisna spremenljivka	Delež pojasnjene variance (R^2)	F-test	P
abs. VO_{2max}	0,93	52,486	0,000
rel. VO_{2max}	0,65	7,951	0,000
Ve_{max}	0,87	28,100	0,000
O_2 pulz	0,93	54,361	0,000
RER	0,44	3,342	0,022

Regresijska analiza kaže močan vpliv morfoloških dimenzij tako na aerobno učinkovitost kot tudi na njene posamezne dimenzije (Tab. 2). Mere telesne sestave v največji meri pojasnjujejo varianco O_2pulza (R^2=93%, P = 0,000) in abs.VO_{2max} (R^2=93%, P = 0,000). Variabilnost VO_{2max} (absolutno in relativno) ter O_2pulza najbolje pojasnjuje AT (za abs. VO_{2max}: Beta = 3.266, P = 0,000; za rel. VO_{2max}: Beta = 2,472, P = 0,022; za O_2pulz: Beta = 3,038, P = 0,000), AMIS (za abs. VO_{2max}: Beta = -1,48, P = 0,001; za rel. VO_{2max}: Beta = -2,796, P = 0,011; za O_2pulz: Beta = -3,665, P = 0,001) in AMAST (za abs. VO_{2max}: Beta = -0,949, P = 0,000; za rel. VO_{2max}: Beta = -3,525, P = 0,002; za O_2pulz: Beta = -0,812, P = 0,000).

Izbrane mere telesne sestave preiskovancev pojasnijo 87% (P = 0,000) variance Ve. To varianco najbolj pojasnjuje AKOS ter AT in AV, vendar beta koeficienta ne dosegata statistične pomembnosti. Varianca funkcije RER je bila z izbranimi morfološkimi merami pojasnjena v manjši meri (44%, P = 0,022). Fantje imajo višjo abs.VO_{2max} kot dekleta (F = 22,93, P = 0,000). Prav tako je tudi skupina starejših preiskovancev dosegla značilno višje vrednosti aerobne učinkovitosti kot skupina mlajših (F = 53,44, P = 0,000). Ko izločimo vpliv telesne sestave in AT in AV, se razlike v aerobni učinkovitosti med fanti in dekleti zelo zmanjšajo in niso več statistično značilne (F = 2,406, P = 0,138). Tudi vpliv kronološke starosti na aerobno učinkovitost se po parcializaciji zmanjša (F = 0,026, P = 0,874). Najpomembnejši in statistično značilni vpliv imata kovariati AMIS (P = 0,034) in AT (P = 0,020), na meji statistične značilnosti pa je še AMAST (P = 0,085). Zelo podobno vpliva na O_2 pulz izločitev telesnih mer. Statistično značilni vpliv na zmanjšanje razlik med spoloma in starostnima skupinama imajo AMIS (P = 0,017), AT (P = 0,008) in AMAST (P = 0,027).

Tudi v drugih parametrih aerobne učinkovitosti se razlike med spoloma in starostnima skupinama po parcializaciji značilno zmanjšajo.

RAZPRAVA

Z merami telesne sestave so zlasti v visoki korelaciji (nad 0,80) tisti mehanizmi aerobne učinkovitosti, ki jih definira predvsem proces rasti. Najvišjo povezanost z mehanizmi aerobne učinkovitosti imata AKOS in AMIS. Vsetulova & Bunc (2004) sta prišla do podobne ugotovitve, kjer je abs. VO_{2max} pozitivno povezana z mišično maso (R=0,5138; P<0,01), poleg tega pa tudi s telesno težo (R=0,4758; P<0,01), indeksom telesne mase (R=0,5004; P<0,01) in celično maso (R=0,4983; P<0,01). Nista pa ugotovila povezave med rel. VO_{2max} in maščobno maso. Podobne ugotovitve so zabeležili v danski raziskavi, kjer so pri 6 do 7 let starih dečkih in deklicah ugotovili, da je abs. VO_{2max} povezana z mišično maso, telesno težo in telesno višino (Eiberg *et al.*, 2005). Raziskava Gorana *et al.* (2000) je pokazala, da je mišična masa najmočnejša determinanta VO_{2max} (R=0,87; P<0,0001) in da ni značilnega vpliva maščobnega tkiva na VO_{2max}.

2 Pri posamezni regresijski analizi oziroma analizi vpliva pojasnjevalnih spremenljivk na posamezno odvisno spremenljivko so bile uporabljene naslednje pojasnjevalne spremenljivke: AT, AV, AKOS, AMIS in AMAST. / During individual regressional analysis, *i.e.* analysis of the impact of explanatory variables on individual dependent variable, the following explanatory variables were used: AT, AV, AKOS, AMIS, and AMAST.

Dinamiko biološkega razvoja v času otroštva in adolescence najbolje opredeljuje skeletni razvoj (Malina & Bouchard, 1992; Rowland, 1996). Dinamika razvoja skeletnega sistema se najbolj ujema z značilnimi spremembami (v obdobju) otroštva in adolescence. S starostjo in vzporedno morfološkim razvojem se povečuje velikost srca in pljuč. Povečata se srčno delo in ventilacija, čeprav se FD in HR skozi obdobje zgodnje adolescence ne spreminjata.

Tudi rezultati regresijske analize potrjujejo, da telesna rast (povečevanje aktivne telesne mase) vpliva predvsem na ventilacijske in srčno žilne dimenzije aerobne učinkovitosti otrok – abs. VO_{2max}.

Na rel. VO_{2max} in metabolične dimenzije aerobne učinkovitosti otroka pa povečevanje aktivne telesne mase nima tako izrazitega pomena. Večji in izrazito negativen vpliv na te dimenzije ima AMAST, ki znižuje relativno aerobno učinkovitost človeka in povečuje prisotnost anaerobnega metabolizma v organizmu. To spoznanje potrjujejo tudi rezultati večfaktorske analize kovariance. Z izključitvijo vpliva dimenzij telesne sestave (AMIS in AV) razlike med spoloma in starostne razlike v srčno-žilnih in respiratornih mehanizmih aerobne učinkovitosti in abs. VO_{2max} postanejo statistično nepomembne. Nasprotno pa, kljub izločitvi vpliva morfoloških dimenzij, razlike med spoloma in starostnimi skupinami ostajajo pri metabolični funkciji aerobne učinkovitosti in rel. VO_{2max}. Mnoge raziskave so prišle do različnih ugotovitev glede vpliva maščobne mase na maksimalno porabo kisika. Tako sta na primer raziskavi Gorana *et al.* (2000) in Vsetulove & Bunca (2004) mnenja, da ni značilnega vpliva maščobnega tkiva na rel. VO_{2max}. Po drugi strani pa raziskava Watanabe *et al.* (1994) kaže na statistično značilno povezavo med rel. VO_{2max} in deležem maščobnega tkiva tako pri dečkih (r = -0,742) kot deklicah (r = -0,843), starih od 12 do 15 let, in poudarja izraziti negativni učinek odvečne telesne maščobe.

Razvoj aerobne učinkovitosti (srčno-žilna in respiratorna funkcija) narekuje proces rasti. Učinkovitost perifernih mehanizmov aerobne funkcije pa je poleg rasti (povečanje AMIS) odvisna tudi od kvalitativnih sprememb, ki nastajajo v obdobju zgodnje adolescence.

Skozi adolescenco se koncentracija aerobnih mišičnih encimov znižuje, nasprotno pa se količina fosfofruktokinaze in drugih anaerobnih encimov v mišici glede na vrednosti v pred-pubertetnem obdobju poveča za 50% (Astrand & Rodahl, 1986; Bar-Or, 1987; Van Praagh, 2000). Zniževanje koncentracije inzulina in povečevanje izločanja kateholaminov v obdobju pubertete negativno vplivata na učinkovitost aerobnega metabolizma, hkrati pa se povečujeta učinkovitosti anaerobne glikolize (Astrand & Rodahl, 1986; Rowland, 1996; Van Praagh, 2000).

ZAKLJUČEK

Absolutna vrednost aerobne učinkovitosti otrok je v visoki povezanosti z njihovim morfološkim razvojem, ki ga najbolje ponazarjata razvoj skeletnega sistema (AKOS) in mišična masa (AMIS). To še posebej velja za srčno-žilne in ventilacijske dimenzije aerobne učinkovitosti. Nasprotno pa so metabolične funkcije aerobne učinkovitosti veliko manj povezane s procesom rasti. Na te funkcije imajo pomemben vpliv tudi kvalitativne spremembe odraščanja – proces zorenja. Učinkovitost metaboličnih dimenzij aerobne funkcije in aerobno učinkovitost, izraženo v relativnih merah, izrazito znižuje masa maščobnega tkiva (AMAST).

THE INFLUENCE OF BODY COMPOSITION DIMENSIONS ON AEROBIC ABILITY OF CHILDREN

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SUMMARY

The main objective of our study was to assess the influence of morphological dimensions on children's aerobic ability at the age of 10 to 14 years. The goal was to establish morphological dimensions, which best explain the aerobic ability dynamics in children during their early days of puberty. The sample comprised 28 elementary school

children - 14 boys and 14 girls. Sample was divided into two groups. The first group comprised 12 children (age of 10.7 ± 0.4 yrs), the second 16 children (age of 14.2 ± 0.5 yrs). The children were non-athletes. All children took anthropometric measures and performed maximal aerobic power test on treadmill. To establish the impact of morphological dimensions on the children's' aerobic capacity, regressional and multifactor covariance analyses were made. The results revealed that morphological dimensions were in high correlation (above 0.80) with aerobic ability mechanisms (especially cardiovascular and ventilation dimensions). Fat mass (AMAST) had an explicitly negative impact on the efficiency of metabolic dimensions and aerobic ability (expressed in relative measures). Fat free mass (AMIS), bone mass (AKOS), fat tissue mass (AMAST), body mass (AT) and height (AV) explain 93% of the variability rel. VO_{2max} and from 44% (respiratory quotient - RER) to 93% (O_2pulse) variability of separate aerobic capacity dimensions. The most significant predictors are fat free mass (AMIS), body mass (AT) and bone mass (AKOS). An explicitly negative impact on the efficiency of metabolic dimensions of aerobic function and aerobic ability (expressed in relative measures) is exerted by fat tissue mass (AMAST). The children's' absolute aerobic ability value is in a very high correlation with the function of growth, which is best presented with the development of the skeleton system (bone mass - AKOS) and fat free mass (AMIS). This holds true particularly for the cardiovascular and ventilation dimensions of aerobic ability. In contrast, the metabolic functions of aerobic ability are correlated with the process of growth to a much smaller extent. These functions are significantly influenced also by the qualitative changes during the growing up period – the process of maturing.

Key words: aerobic ability, body composition, anthropometry, puberty

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DELO NAŠIH ZAVODOV IN DRUŠTEV

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ACTIVITIES BY OUR INSTITUTIONS AND ASSOCIATIONS

PET LET SODELOVANJA ZAVODA RS ZA VARSTVO NARAVE IN KNEŽEVINE MONAKO NA PODROČJU VARSTVA NARAVE

Zadnji dan maja in prvi dan junija 2006 se je v Sloveniji mudil Njegova Presvetla Visokost monaški knez Albert. Ob običajnih protokolarnih vsebinah tovrstnih državniških obiskov je bil obisk prvega moža Kneževine Monako namenjen predvsem varstvu narave. Natančneje, seznanitvi s projekti, ki jih je v preteklih petih letih, ob finančni pomoči kneževine, izpeljal Zavod RS za varstvo narave. Ohranjanje narave in predvsem varstvo morskega ekosistema je že desetletja ena pomembnih dejavnosti monaške knežje družine Grimaldi. Knez Albert predseduje, podobno kot že njegov oče pred njim, komisiji za znanstveno raziskovanje Sredozemlja (CIESM), ki združuje prek 1500 znanstvenikov iz vseh sredozemskih držav. V Monaku so države podpisnice Barcelonske konvencije podpisale dodatke k Protokolu o posebej zavarovanih območjih in biotski raznovrstnosti v Sredozemlju. Omenjeni dodatki vključujejo tako seznam ogroženi vrst kot kriterije za izbor območij, ki so posebnega pomena za ohranjanje biotske raznovrstnosti v Sredozemlju. Nenazadnje pa Monako gosti tudi sekretariat dogovora o varstvu kitov v Sredozemlju, Črnem morju in bližnjih vodah Atlantika (ACCOBAMS) in je ustanovni član velikega zavarovanega območja, ki se v Genovskem zalivu razteza na kar 87.500 km^2.

Sl. 1: Robert Turk predstavlja knezu Albertu knjigo "Ogrožene vrste in habitatni tipi v slovenskem morju", ki jo je s finančno pomočjo Kneževine Monako izdal Zavod Republike Slovenije za varstvo narave.
Fig. 1: Robert Turk presenting to His Highness Prince Albert the book "Endangered Species and Habitat Types in the Slovenia Sea", edited by the Institute of the Republic of Slovenia for Nature Conservation with financial support of the Principality of Monaco.

Sl. 2: Naslovnica študije o habitatnih tipih na območju Strunjanskih solin in Stjuže.
Fig. 2: Front cover of the study covering various habitat types in the areas of Strunjan salt-pans and Stjuža.

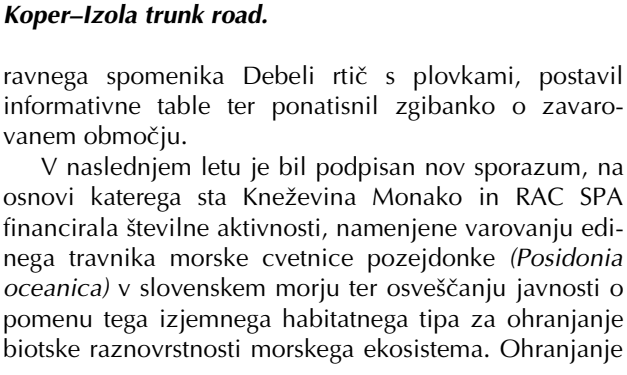
Zamisel o sodelovanju Zavoda RS za varstvo narave in Urada za mednarodno sodelovanje Kneževine Monako je pravzaprav rezultat sodelovanja predstavnikov obeh institucij na področju uresničevanja določb Barcelonske konvencije oz. njenega Protokola o posebej zavarovanih območjih in biotski raznovrstnosti Sredozemlja. Na osnovi razgovorov o potrebnih aktivnostih na področju varovanja morskih zavarovanih območij ter biotske raznovrstnosti slovenskega morja in morskega obrežja je bil leta 2002 sklenjen prvi sporazum o sodelovanju, v katerem je sodeloval tudi regionalni center za zavarovana območja Barcelonske konvencije s sedežem v Tunisu (RAC SPA). Na osnovi sporazuma je Zavod RS za varstvo narave označil morsko mejo Na-

Sl. 3: Informativna tabla o edinem travniku pozejdonke v Tržaškem zalivu – ob obalni cesti Koper–Izola.
Fig. 3: Information board about the only *Posedonia oceanica* ***meadow in the Gulf of Trieste – along the Koper–Izola trunk road.***

ravnega spomenika Debeli rtič s plovkami, postavil informativne table ter ponatisnil zgibanko o zavarovanem območju.

V naslednjem letu je bil podpisan nov sporazum, na osnovi katerega sta Kneževina Monako in RAC SPA financirala številne aktivnosti, namenjene varovanju edinega travnika morske cvetnice pozejdonke *(Posidonia oceanica)* v slovenskem morju ter osveščanju javnosti o pomenu tega izjemnega habitatnega tipa za ohranjanje biotske raznovrstnosti morskega ekosistema. Ohranjanje travnikov pozejdonke je opredeljeno kot prioriteta tako v okviru Barcelonske konvencije kot v okviru habitatne direktive EU. V letu 2003 je Zavod RS za varstvo narave pridobil digitalne ortofoto posnetke rastišča med Žusterno in Izolo, izdelal natančno karto rastišča, označil rob travnika na morskem dnu, s pomočjo morske biološke postaje v Piranu opravil raziskave najpomembnejših ekoloških dejavnikov na rastišču, organiziral predavanja dveh profesorjev korziške univerze na temo podvodnih travnikov, pripravil razstavo o podvodnih travnikih in postavil informativne table na parkirišču v neposredni bližini rastišča in na kopališču v Žusterni.

Uspešna uresničitev vseh naštetih aktivnosti je botrovala podpisu novega, tokrat triletnega sporazuma za obdobje 2004–2006, ki je sodelovanje razširil tudi na področje Alpske konvencije. V uresničevanje programa se je tako poleg piranske vključila tudi kranjska območna enota Zavoda RS za varstvo narave. V letu 2004 je bilo opravljeno kartiranje habitatnih tipov na območju Naravnega rezervata Strunjan – Stjuža, pripravljena je bila razstava ter izdana zgibanka o mokriščih na območju sotočja Save Dolinke in Save Bohinjke, izpeljana je bila inventarizacija ptičjih vrst na tem območju ter zgrajeno razgledišče na Šobčevem bajerju. V letih 2005 in 2006 so bile aktivnosti kranjske enote ZRSVN usmerjenje v varovanje narcisnih travnikov na Jelovici, v uresničevanje sporazuma pa se je vključil tudi Triglavski narodni park z varstvenimi ukrepi na območju Kleka. Piranska enota ZRSVN pa je v zadnjih dveh letih izpeljala postavitev lesene pešpoti prek sredozemskega slanega travnika pri sv. Nikolaju v Ankaranu ter izdajo knjige "Ogrožene vrste in habitatni tipi v slovenskem morju", avtorjev Lovrenca Lipeja, Roberta Turka in Tihomirja Makovca.



Sl. 4: Lesena pešpot na območju sredozemskega slanega travnika pri sv. Nikolaju v Ankaranu.
Fig. 4: Wooden pathway within the area of Mediterranean salt meadow near Sv. Nikolaj at Ankaran.

Vse navedene aktivnosti so NPV Knezu Albertu in drugim članom delegacije Kneževine Monako (predsedniku vlade, članom parlamenta) predstavili mag. Robert Turk, vodja piranske enote, in Metod Rogelj, vodja kranjske enote Zavoda RS za varstvo narave, ter mag. Martin Šolar iz Triglavskega narodnega parka, ob njihovem obisku piranske Morske biološke postaje in blejskega gradu. Posebej natančno se je o opravljenem pozanimal NPV Knez Albert in izrazil veliko zadovoljstvo nad dosedanjim sodelovanjem, hkrati pa obljubil svojo pomoč in podporo tudi v prihodnje. Na osnovi navedenega že potekajo pogovori med Zavodom RS za varstvo narave in Uradom za mednarodno sodelovanje Kneževine Monako o bodočih aktivnostih in novem triletnem sporazumu o sodelovanju.

Robert Turk

OCENE IN POROČILA
RECENSIONI E RELAZIONI
REVIEWS AND REPORTS

Lovrenc Lipej, Robert Turk & Tihomir Makovec:
ENDANGERED SPECIES AND ENDANGERED HABITAT TYPES IN THE SLOVENIAN SEA
Zavod RS za varstvo narave, Ljubljana, 2006

On the occasion of the international "Conservation of Biodiversity in the Northern Adriatic" workshop held the 25th of May 2006 in Strunjan (Slovenia), the book entitled *"Endangered Species and Endangered Habitat Types in the Slovenian Sea",* written by Lovrenc Lipej, Robert Turk and Tihomir Makovec, was presented.

The Gulf of Trieste is known from time immemorial for its marine flora and fauna richness. Because of this wealth, many European researchers have travelled to our coast since the second half of 19th century to study and collect biological material for private collections or museums.

Many species, common in the Adriatic and Mediterranean Seas, bring today in their scientific name the testimony of a past dedicated to the first observations, morphological descriptions of organisms and the long stays of many eminent scientists *(e.g. Muggiaea kochi)* in the Gulf of Trieste, at that time considered a true paradise for naturalists. The main consequence of this proliferation of science and scientists in the northern Adriatic area was the establishment of many institutions devoted to marine research. Within many scientists, Aristocle Vatova must be mentioned. Born in Koper in 1897, he is no doubt the father and pioneer of the benthos ecology research in the Adriatic Sea. His subdivision of benthic dominion in zoocoenoses has remained valid till this very day. The citation of his work (1949) in this new publication must be considered a rightful legitimization.

The Gulf of Trieste and the entire northern Adriatic area in general holds an important and traditional fishery activity. The purse seine net, locally known as "sacaleva", used to catch small pelagic fish, was designed and built in Izola (1927). The consequence was the development of numerous fish industries, mainly in Izola, for many decades representing one of the most important economic activities in the Istrian Peninsula.

The marine environment was subjected to many kinds of stresses due to human activities. Large coastal portions were modified, industrial and urban plants have caused a production and dispersion of polluting compounds into the sea, trawling fishery has played an important part in the modification of the seabed. Consequently, the Slovenian sea could no longer be recognized as naturalists' paradise anymore. However, it should be pointed out that these human activities have raised the living standard of the local population.

Only in the 1960s, the concept of ecology began its gradual development, and today more attention is devoted to the protection of the environment. Many studies have been made till now and a more detailed knowledge about marine environment is available.

The present book, almost 240 pages long, presents the synthesis of all available data and cognitions about the species and habitat types that could die or disappear in the natural environment of the Slovenian coastal sea. The book is written in Slovenian and in English, which will enlarge the circle of readers, both scientists who will be able to use the passed on knowledge and the admirers of the marine environment.

In the introductory part, the authors emphasize that the book is a marine Red List, which comprises not only endangered animal and vegetal species, like other Red Lists do, but endangered habitat types as well. In the next chapter, the reader can find the main characteristics of the Mediterranean, Adriatic and of the small although in no way poor Slovenian sea. The research methods follow, with an explanation of the criteria used in the selection of endangered species and habitat types. The ensuing longer chapters comprise exhaustive descriptions of endangered species in the Slovenian sea, data about their expansion, habitats and threats to their survival. Here, three species of seagrasses and 41 animal species, from sponges, anthozoans, gastropods, bivalves and crabs to cartilaginous and bony fishes, turtles, birds and mammals are presented. The accompanying photos, maps and excellent drawings enrich descriptions of species and their distribution in the marine environment.

In the chapter dealing with endangered habitat types in the Slovenian sea, the authors describe endangered biocenoses in the coastal belt. The list includes two supralittoral, four mediolittoral, six infralittoral and four circalittoral biocenoses. The very clear description of various biocenoses will give an opportunity to identify such habitat types in the natural environment also to a layman. In the next thematic block, the authors point out the factors affecting the biodiversity of the Slovenian sea and could greatly contribute to habitat degradation. These are not only factors originating from human activities, like urbanization and consequently pollution, fishing and mariculture activities, but also factors of natural origin, like the constant slow spreading of southern species toward the north.

The book also lists research institutions engaged in research of marine biodiversity and the legal tools designed for the conservation of biotic and landscape diversity as well as for sustainable use of natural sources. Some data are also given on Marine Protected Areas and their importance in the conservation of marine biodiversity in Slovenian waters like in other seas, with the

list of action plans adopted by contracting parties of the Barcelona Convention for the protection of the Mediterranean monk seal, marine turtles, cetaceans, marine vegetation, birds, chondrichthyan fishes and for the prevention of non-indigenous species being introduced in these waters.

The present publication is a precious, qualitative review of endangered species and habitat types in the Slovenian sea, which should not be the only book dealing with this topic, but should represent just the beginning of a constant, professional monitoring of endangered animal and vegetal species and their living environment in the Slovenian sea, earmarked for the prevention of irreparable damages. The book is enriched by valuable biological data as well as by long-standing experience in this field, presented through the eyes of three authors with different profiles: an enthusiastic scientist, a fanatic nature-conservator and a talented photographer and designer.

Nicola Bettoso & Martina Orlando Bonaca

DIVERSIDAD Y CONSERVACIÓN DE LOS AMBIENTOS KÁRSTICOS: EJEMPLOS VALENCIANOS Y ESLOVENOS/ PESTROST IN OHRANJANJE KRAŠKE POKRAJINE: PRIMERI IZ VALENCIJE IN SLOVENIJE/ DIVERSITY AND CONSERVATION OF KARST LANDSCAPES: VALENCIAN AND SLOVENIAN EXAMPLES

Znanstveno-raziskovalno središče Koper Univerze na Primorskem je do lanske jeseni na Kraškem robu opravljalo triletni projekt "Ohranitev in varstvo ogroženih habitatov/ vrst na območju Kraškega roba". V treh letih, kolikor je trajal projekt, ki ga je sofinancirala Evropska unija prek program LIFE-Narava, so primorski strokovnjaki skupaj s številnimi domačimi in tujimi partnerji poskušali ustvariti razmere, ki naj bi omogočile ohranitev narave in kulturne krajine ter izjemne biotske pestrosti, predvsem z aktivno soudeležbo lokalnega prebivalstva.

Za dosego tega cilja pa so bile koristne španske izkušnje. Med partnerji je bila namreč tudi vlada avtonomne španske province Valencije, kjer so že pred leti uspešno začeli uresničevati naravovarstveni model mreže rastlinskih mikrorezervatov, ki tudi v evropskem merilu dobiva vse večji pomen in podporo. Več kot dvesto takih rezervatov v Valenciji daje izvrstne rezultate pri varovanju ogroženih vrst, predvsem ker je takšen način veliko preprostejši in hitreje izvedljiv od prizadevanj za zaščito kompleksnejših območij. Zaradi velikih podobnosti med kraškimi pokrajinami v Valenciji in na našem Kraškem robu ter velike pestrosti življenja na obeh območjih ne čudi, da je prišlo do sodelovanja v skupnem projektu. Eden izmed rezultatov je tudi skupni, trijezični (špansko-slovensko-angleški) zbornik, ki nam skozi prispevke strokovnjakov primerjalno predstavlja poznavanje pestrosti življenja in prizadevanja po ohranjanju kraških pokrajin v Valenciji in Sloveniji.

Za podrobnejšo predstavitev Valencije in njenih predvsem rastlinskih bogastev v zborniku ni dovolj prostora, spoznamo le osnovne pokrajinske poteze in pomen rastlinstva, med katerim so številni endemiti in relikti. Izpostavljen je kraški svet s podzemnimi jamami in kraškimi kali. Takšna okolja dajejo možnost za preživetje številnim vrstam, ki ga v sušni pokrajini sicer ne bi imele. Verjetno za nas, slovenske bralce najpomembnejši del zbornika pa je predstavitev izkušnje, ki so si jo v Valenciji pridobili z razvojem rastlinskih mikrorezervatov. Emilio Laguna, ki velja za očeta tega valencijskega pristopa k ohranjanju narave, nas skupaj s sodelavci popelje na začetek devetdesetih let, ko je nastala pobuda po nastanku omrežja majhnih območij, ki so pomembna za ohranitev redkih in ogroženih vrst. Tako je mogoče brez dolgotrajnih zakonskih priprav, ki jih za sabo potegne ustanavljanje parkov, doseči hitro in učinkovito varovanje populacij tudi na zasebnih zemljiščih. Pokrajinski svet valencijske avtonomne vlade namreč daje finančno podporo, od enkratnih odškodnin za vključitev v omrežje do dotacij (tudi do 18 tisoč evrov letno na posameznega lastnika) za nakup zemljišč in izdelavo načrtov upravljanja. Od dobrih 230 mikrorezervatov, kolikor jih je bilo v Valenciji ob nastajanju zbornika, je 30 zasebnih. Ker omrežje mikrorezervatov velja za eno najbolj izjemnih pobud na področju varstva in ohranjanja rastlinstva v evropskem merilu, valencijski strokovnjaki sodelujejo pri prenosu tega modela v druge dežele, med katerimi je tudi Slovenija, za začetek zgolj s Kraškim robom.

V prispevku slovenskih avtorjev kratki predstavitvi projekta na Kraškem robu (avtorjev Andreja Sovinca in

Bojane Lipej) in metodam kartiranja habitatnih tipov (Mitje Kaligariča in Branke Trčak) sledi predstavitev flore in vegetacije (M. Kaligarič), posebej sta izpostavljeni dve vrsti, stenoendemična Tommasinijeva popkoresa in raznolistna mačina, prva ogrožena zaradi človekovih aktivnostih v stenah, druga predvsem zaradi hitrega zaraščanja travišč (M. Kaligarič in Boštjan Surina). Od živali, ki najdejo zavetje v bogastvu rastlinskega sveta, sta Andrej Gogala in Dušan Devetak predstavila stenice in mrežekrilce, Franc Rebeušek metulje, Boris Kryštufek sesalce, Lovrenc Lipej, Andrej Sovinc in Bojana Lipej pa so obdelali ptice, še posebej ujede in sove. Poleg suhih kraških travišč in skalnatih ostenij, ki jim je namenjen največji del pozornosti, se bralec lahko zadrži še pri kalih in vlogi, ki jo imajo ti vodni objekti za ohranjanje ogroženih vrst, predvsem dvoživk. Pomen kalov v nekdanjem življenju domačinov je orisala Zvona Ciglič, med dvoživkami, ki naseljujejo kale, edine stoječe površinske vode na Krasu, pa se je sprehodila Katja Poboljšaj. Rezultat preučevanja rastlinstva in živalstva je – skladno s španskimi izkušnjami – na koncu zbornika predstavljeni predlog za mikrorezervate na Kraškem robu. Od tridesetih predlaganih je največ – skoraj polovica – suhih travišč, drugo so kali ter stenska in gozdna okolja.

Označeni mikrorezervati so v času projekta zaživeli tudi na ozemlju Kraškega roba, na potezi pa je država, da prizadevanja po tovrstni zaščiti razširi tudi na druga občutljiva in vrstno bogata območja ter postavi pravne okvire, sicer se dobra praksa z druge strani Sredozemlja ne bo uspešno zasidrala na naših tleh. V prazno bodo izzvenele besede valencijskih strokovnjakov, ki sta sodelovala v projektu, da Sredozemlje ni zgolj morje, marveč vodna pot, po kateri se poleg kultur pretakajo tudi znanja in izkušnje, nenazadnje tudi take, ki so povezane z varstvom narave in upravljanjem okolij.

Igor Maher

Davorin Tome, Andrej Sovinc & Peter Trontelj:
PTICE LJUBLJANSKEGA BARJA
DOPPS, Ljubljana, 2005

Knjiga Ptice Ljubljanskega barja je prišla na mojo knjižno polico ravno v pravem času. Čeprav sem tako ali drugače s pticami povezan že petinštirideset let, je naše največje barje zame skoraj čista neznanka. A ko sem v začetku tega leta sklenil, da pod drobnogled vzamem nekatere izmed ptic, ki gnezdijo v tem predelu Slovenije, sem ugotovil, da je ta knjiga nepogrešljiv spremljevalec prav takšnih, ki se sami prvič odpravljamo odkrivat skrivnosti Ljubljanskega barja.

Pa poglejmo, kaj nam knjiga, ki je izšla leta 2005 v založbi Društva za opazovanje in proučevanje ptic Slovenija, ponuja na svojih 418 straneh. Pričakovanja so upravičeno visoka, že ko pregledamo avtorje – tri priznana imena slovenske ornitologije: Davorin Tome, Andrej Sovinc in Peter Trontelj. Pri tako obsežnem delu sodelavcev na terenu ni nikoli preveč, in tokrat je avtorjem priskočilo na pomoč 38 popisovalcev ptic, 31 pa je bilo zunanjih sodelavcev Prirodoslovnega muzeja Slovenije, ki so prispevali podatke o ujetih oz. obročkanih pticah.

Kartiranje ptic je bila osnova za doseganje dveh ciljev: naravoslovnega in naravovarstvenega. Pri prvem gre za dokumentiranje stanja ptic, in sicer števila posameznih vrst, kdaj in kje se zadržujejo, kdaj in kje gnezdijo in podobno. Še pomembneje se mi zdi sledenje naravovarstvenemu cilju, kjer gre predvsem za ugotavljanje, ali so območja na Barju pomembna za ohranitev posameznih vrst v nacionalnem in mednarodnem merilu. Ta za ogrožene ptice zelo pomembna območja so avtorji iskali in določili z metodo kopičenja števila osebkov nacionalno pomembnih vrst v posameznih kvadrantih. Po analiziranju gostote izbranih ptic na posameznih površinah so avtorji določili vzhodno, zahodno in severno pomembno območje. Skupno so na Barju določili 42 odstotkov celotne površine, ki imajo za tam

gnezdeče ptice velik pomen. Ločeno so obravnavane ogrožene ptice, ki gnezdijo v odprtih biotopih (prepelica, kosec, priba, veliki škurh, poljski škrjanec, drevesna cipa, repaljščica, močvirska trstnica, siva penica) in v grmovno-gozdnih sestojih (sloka, rečni cvrčalec, kobiličar, pisana penica). Osnova za določitev pomembnosti je bilo število parov v kvadratu 1 x 1 km. Lahko bi rekli, da so bili naravovarstveni cilji in prizadevanja uspešni, saj so bili zaključki temelj za uvrstitev območja v mrežo Natura 2000 – ključni steber varstva narave v Evropski uniji. Delo 41 ornitologov in drugih sodelavcev, ki so skupaj opravili 1593 ur opazovanj in zbiranja podatkov na terenu, se je tako obrestovalo že na samem začetku.

Prva tri poglavja izmed štirinajstih nas na kratko seznanjajo s pticami Barja, z zgodovino raziskovanja, geografijo, podnebjem in življenjskimi prostori tega predela. Naslednja poglavja pred osrednjim delom so namenjena predstavitvi metod zbiranja podatkov za ptice pomembnih območij. Manj izkušenim pride prav poglavje "Kako brati knjigo". To poglavje skupaj z metodologijo dela je prevedeno tudi v angleščino.

Delo obravnava 258 vrst ptic, ki jih natančno prostorsko in časovno opredeljuje. Te so v glavnem delu nazorno predstavljene s tekstualnim delom, fenogramom opazovanj, gnezdilke s karto razširjenosti ter s tabelo statistike zbiranja podatkov. Bralec v tekstualnem delu najprej izve, kakšen status sploh ima obravnavana ptica. Najpomembnejša je seveda ločnica med gnezdilkami (nedvomna ali potrjena, verjetna, možna) in tistimi, ki so se tam le zadrževale ali območje raziskave preletele. Kjer je bilo število podatkov za neko vrsto dovolj veliko, so avtorji le te prikazali statistično obdelane v tabelah in diagramih, tako da bralec dobi natančno predstavo o raziskanih spremenljivkah. Branje tega dela je kot pojedina iz polne sklede – vsakdo si vzame toliko, kolikor potrebuje. Mislim pa, da prav nihče, ki bo kdaj kasneje delal primerjave v zvezi s statusom, fenologijo ali dinamiko populacije posamezne vrste, ne bo imel težav, saj so vsi potrebni podatki prikazani nadvse nazorno.

Problem pa je, kadar hočemo neko vrsto poiskati na terenu. V knjigi je v kodirani mreži v rastru 1 x 1 km za gnezdeče vrste na simboličnem zemljevidu prikazano, v katerem kvadratu neka vrsta ptice gnezdi. Tudi največje število najdenih gnezdečih parov v kvadratu je ponazorjeno z velikostjo kroga. Pogrešil pa sem natančen zemljevid z vsemi topografskimi podrobnostmi. Še najboljše bi bilo, če bi bil odtisnjen na zadnjo stran in hrbtišče knjige, kjer bi ga našli zelo hitro. Nič ne bi bilo narobe, če bi bil celo na formatu A2 in nato zložen ob notranjem delu platnice. Na njem naj bi bile vrstice in kolone označene enako kot na manjših "zemljevidih" posameznih vrst, in tako bi bilo iskanje gnezdečih vrst – delo na terenu zelo olajšano. Zemljevid je sicer izšel skupaj s seznamom napak, ni pa razdeljen v kolone in stolpce – nima mreže. Ker je tudi premajhen, bo najboljše, če si ga izdelate sami, posebno če načrtujete obsežnejše delo na terenu.

Monografija Ptice Ljubljanskega barja je zgodovinski presek avifavne ob koncu 20. stoletja, visoke strokovne in kulturne vrednosti, po kateri bodo lahko segali sedanji rodovi in zanamci, ki bodo ta predel hoteli natančno spoznati in raziskati ali samo poiskati enkratne lepote in uživati v njih.

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